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Transportation Test of Heaters in Refrigerator Cars with Bananas, New Orleans to Winnipeg - January 1951

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Transportation Test of Heaters in Refrigerator Cars with Bananas.
New Orleans to Winnipeg - January 1951

Bananas require a very close control of temperature to prevent ripening during periods of shipment from coastal ports to points of distribution and consumption. The desired temperature range of 54° to 56° F. makes it mandatory that very close controls be maintained on both the refrigeration and heating applied in transit. Accurate control of the heat applied is highly important during extremely low outside temperatures commonly encountered in the winter movement from New Orleans to Canadian destinations. It was for this reason that the Department conducted a test on the underslung type of charcoal heater during the winter of 1949-50 which was reported in H.T.&S. Office Report No. 226. Factors in the control of temperatures during cold weather of concern to the Fruit Dispatch Company and the railroads are leaving car drains open when portable charcoal heaters are used in end bunker cars and the value of automatic or self-sealing drains as installed on certain types of cars. A test was planned and conducted by the Department to determine the effect of open drains and self-sealing type drains on heater operation and fruit temperatures near the drains. In addition, information was desired on the performance of thermostatically controlled alcohol heaters in both non-fan and fan cars and further performance data on the underslung heater.

EXPERIMENTAL EQUIPMENT AND PROCEDURE

Of the nine cars used in the test, seven were Illinois Central cars of the 50,000 series, one an NRC 18,000 series with external trap drains, and the ninth was an aluminium fan car (IC 51,000) with self-sealing drains. Three of the seven Illinois Central cars were non-fan, and 4 were fan cars with one of the latter equipped with an underslung heater. The cars used, types of heaters, types of drains and whether open or closed are indicated below:

Car No.	Type Car	Heater	Drains	Treatment
A-IC 50187	Non-fan	Charcoal	conventional	open
B-IC 50071	"	"	"	plugged
C-IC 50189	fan	"	"	open
D-IC 50114	"	"	"	plugged
E-IC 50163	non-fan	Alcohol	"	open
F-IC 50190	fan	"	"	open
G-IC 51000	"	"	self-sealing	closed
H-NRC 18464	non-fan 1/	"	external trap	open
J-IC 50426	fan	Underslung	conventional	plugged

1/ Fan car but operated with fans off.

Test Cars

The 50,000 series cars (cars A to F) were in good condition and contained 3" to 3 1/2" of insulation. All had been rebuilt within the past few years. Floor racks were diagonal and in the non-fan cars were 6" in height and in the fan cars 7 1/2". As no non-fan car of the NRC 18,000 series was available it was necessary to use a fan car with the fans off. This car (car H) contained 4-4 1/2" of insulation with 7 1/2" floor racks with wood slats and metal stringers. The IC 51,000 (car G) was constructed mainly of aluminium and contained 4 to 4 1/2" of insulation. The floor racks were of metal construction, 7 1/2" high. The car contained side wall flues and was equipped with the Duryea sliding underframe. The conventional drain consisted of a trap on the floor of the drain pan in the bottom of the bunker, a vertical drain pipe with an inclined trough at the bottom to carry the water to the side of the car. The self-sealing drain on the IC 51,000 car consisted of a hinged cap on the bottom of the vertical drain pipe, counter weighted to close the end of the pipe. In the NRC car the bottom end of the vertical drain pipe was covered by a bowl attached to the drip trough to form a water seal against loss of cold air when under refrigeration, and it prevented direct access of cold outside air to the drain pipe during cold weather thus giving a certain amount of protection although permitting some air into the bunker at all times. For cleaning purposes, this bowl and trough were hinged to swing out of the way.

Heaters

All of the portable charcoal heaters were of the standard one piece type with 30 lbs. capacity except one in car A which was a regular two piece banana type heater of 20 lbs. capacity. They were installed and fueled at St. Paul, Minnesota at the start of the heating period. The alcohol heaters were Preco thermostatically controlled heaters which were installed at New Orleans, Louisiana. A full description of this type heater may be found in a report of previous tests. 1/ The Luminator-Mitchell underslung heater was manually controlled and of the same type described in H.T.&S. Report No. 226.

Commodity and Air Temperatures

Six fruit and six air temperatures were obtained in each car by means of distant reading electrical resistance thermometers. The positions in which the thermometers were placed and their designations are as follows:

	Position	Designation
Fruit -	Bottom bunker center line, head and rear	BBCL-H, BBCL-R
	Top bunker centerline, head and rear	TBCL-H, TBCL-R
	Bottom doorway centerline	BDCL
	Top doorway centerline	TDCL

1/ Car Heaters and Winter Protection of Fruit Shipments - Summary of Transportation Tests with Apples from Washington State, Dec. 1947, Jan. & Feb. 1948.

Air -	Under ice grates, head and rear bunkers	Air bunker H, Air bunker R
	Bottom bunker centerline, head and rear	Air BBCL-H, Air BBCL-R
	Top doorway centerline	Air TDCL
	Bottom doorway centerline	Air BDCL

Bottom fruit temperatures were obtained by inserting a resistance thermometer into a banana in the bottom hand of the bunch nearest the desired position, about 10" to 12" above the floor rack. In one-layer loads (commonly referred to as one-tier loads) the top position was in a top banana of the topmost hand and from 36 to 40" above the floor rack. In one and one-half-layer loads the top position was in a banana on the top side of the horizontal bunch nearest the desired position in the car. The bunker air temperatures were taken under the ice grates at the centerline of the car near the bulkhead (separating bunker from loading space) and approximately 3" above the drip pan. The BBCL air positions were in the loading space at the centerline of the car 1" from the bulkhead and 3" above the floor rack. Top and bottom doorway air positions were adjacent to the positions normally used by Liquidometer thermometer bulbs although none of the test cars were so equipped. Upon arrival at Chicago the cars were reversed due to being moved through the wye at Congress street. This required a reversal in ventilation and is noted in the tables containing the transit temperatures.

Fruit (pulp) temperatures were taken by Fruit Dispatch Company personnel at all regular inspection stations, using hand thermometers in bananas near the bottom and top of bunches at the doorway in accordance with regular inspection practice. Ventilators were manipulated and heaters operated on the basis of fruit temperatures indicated by these inspections which are presented in Table 1.

In order to determine whether there was any effect on the composition of the air inside the car by either plugging the drains or leaving them open, provision was made to obtain samples of the air at the doorway centerline position at the floor. Rubber tubing was used inside the car and copper tubing was used to extend outside the car between the two halves of the door. Samples were thus drawn from the car into sample tubes by means of an aspirator without opening the car. A portable Hays gas analyzer was set up in the business car and samples were analyzed en route for percentage of oxygen and carbon dioxide, and also carbon monoxide after the heaters were lit. Tubes were also placed to obtain air samples from the level of the ice grates in the rear bunkers of cars F and G.

Test Procedure

Resistance thermometers were placed in position in the fruit during the loading. Readings averaging 2 to 3 per day were made at all terminal stops. Doorway commodity temperatures were taken and the fruit inspected at the regular banana inspection stations at Jackson, Mississippi; Memphis, Tennessee; Fulton, Kentucky; Bluford, Illinois; Chicago, Illinois; E. Dubuque, Illinois;

St. Paul, Minnesota, Grand Forks, N.D. and Winnipeg, Man. Supplementary inspections were made by the test party at Hawthorne, Ill., Fargo, N.D. and Noyes, Minn. A final inspection and temperature reading was made just prior to unloading at Winnipeg, Man. and final inspection of heaters was made after unloading.

Ventilators remained closed enroute to Memphis, Tenn. when all rear vents were opened on the irons or approximately 2". At Fulton, Kentucky all rear vents were opened full or 10". Due to the reversal of the cars at Chicago all vents that had been in the rear to this point were closed. Rear vents (formerly head end) were closed but plugs were attached (1/2" opening) in cars C, D, F, G, and J from Chicago to St. Paul when all were closed tight after the heaters were lit.

The alcohol heaters were funished by The Burlington Refrigerator Express Co. and were shipped to New Orleans and fueled and installed after loading. The portable charcoal heaters were installed at St. Paul and were fueled and lit at that point. The alcohol heaters and the underslung charcoal heater were lit also at St. Paul when the weather forecast indicated sub-zero weather during the next twelve hours. Thermostats on the alcohol heaters were set at 57 1/2° but were reset to 60° at Grand Forks, N.D. in order to raise fruit temperatures somewhat before unloading. Charcoal heaters were removed en route if fruit temperatures rose too high. The draft on the underslung heater was set at position 4 at St. Paul and was not changed thereafter.

Loading and Routing and Unloading

The test cars were loaded on January 17 at New Orleans between 8:30 and 11:55 A.M. The bananas were of the Guatemala variety in excellent green condition and were unloaded from the steamship Chiriqui. Two sizes of bananas were loaded, four cars with light nines and five cars with heavier medium nines. Average stem weight varied from 70.8 lbs. to 88.4 lbs. The light nines were loaded in 1 1/2 layers while the medium nines were in one layer. Net weight of the loads were nearly the same in all cars varying from 20,830 lbs. to 21,525 lbs. Stems in the bottom layer or in single-tier loads were placed upright on the stalks in alternate rows across the car. The top layer in 1 1/2 layer loads was placed horizontally in a T shape at each end of the car. In other words, 2 stems were laid crosswise of the car over 3 or 4 end stacks at each end of the car, then one stem at the center line over the next 3 or 4 stacks. This type of loading is called "one and one half" and the number of rows or stems in the top layer in each end is designated 8x8 flat or 7x7 flat depending on the number so placed. Two "key" bunches were placed crosswise of all loads at the doorway for the purpose of wedging the load solidly endwise of the car. These worked down towards the floor rack as slack developed in the load in transit. Complete loading data is contained in Table 2.

The test cars were assembled at the Sty Dock yards (New Orleans) of the Illinois Central Railroad and the first temperature reading was taken at 4 P.M. on the day of loading. Departure from New Orleans was at 6:50 P.M. with routing via IC, C B & Q, G.N. and Midland Railroads. Total elapsed time from New Orleans to St. James yard, Winnipeg was 112 hrs. 30 minutes of which it is estimated that 62 hrs. 25 minutes (55.5%) was running time. This is a better record of running than was made in the previous test in spite of an 11 hour delay in Grand Forks to repair a broken coupler on the business car.

As previously noted all the cars were reversed in Chicago when the train was "wyed" at Congress Street. Arrival time at St. James yard was about noon and the cars were switched for spotting during the afternoon and evening for unloading the next morning. There was practically no fan operation during this period.

Unloading began at 7:00 A.M. the day after arrival and continued until 4 P.M. A final temperature reading was made on all cars prior to opening the doors and heaters were checked shortly thereafter. Unloading conditions varied considerably, some cars having no protection whatever, the bananas being carried out of the car and across the platform fully exposed to 10° F. air temperatures. Two of the cars had canvas tunnels completely protecting the fruit. The number of ripe and turning bunches was noted by test party members as unloading proceeded.

Discussion of Results

The weather was above normal en route as far as Hawthorne, Illinois. A high of 72° F. was reached on loading day at New Orleans and 70° during the first day en route. Minimums of 56° and 42° respectively for the first two days were well above normal for this time of year. Colder weather was encountered on the third day at St. Paul with a minimum of 25° below zero the following morning at Fargo, N.D. Temperatures moderated somewhat for the balance of the trip with unloading temperatures of between 5° and 10° at Winnipeg. Figure 1 shows the outside air temperature for the entire trip.

Portable Charcoal Heaters

The temperature and heater records of the four test cars with portable charcoal heaters (A, B, C & D) are presented in Tables 3 to 6 and 12 to 15 respectively with a graphical presentation in Figures 2 to 5 inclusive. As previously noted, the heaters were installed and lit at St. Paul when below zero temperatures were forecast for the next 12 hours. By 8:00 a.m. the next morning or after 16 hours burning, there was considerable difference in fruit temperatures between these 4 cars.

In Car A (non-fan) with the drains open, exceedingly high top layer fruit temperatures (81°) were found at this point at the ends of the car next to the bulkheads. This would indicate a higher burning rate of the heaters although the estimated fuel consumed is about the same as Car B with drains plugged (Tables 12 and 13). Any other possible factor causing this high temperature is not known. However, it is believed that lighting both heaters was not necessary and that adequate protection without the excessive temperature rise would have been afforded by only one heater. Because of these high temperatures in Car A, both heaters were removed at Fargo, N.D. and no further heat added. Although top temperatures were still well above the danger point at Grand Forks, N.D. a bottom doorway pulp temperature of 55° prompted the plugging of the drains at this point to prevent any possible chilling of bottom fruit inasmuch as the high top temperature made further heating undesirable. Car C (fan car - drains open) also showed a considerable rise in fruit temperature at Fargo (Figure 4) but due to air circulation from the fans the temperatures were much more uniform, with a maximum of only 67.5°F. The rear heater only was

removed from Car C at Fargo and the front heater was left burning until arrival at St. James Yard, Winnipeg. Average fruit temperatures in Cars B and D rose about the same amount between St. Paul and Fargo (Figures 3 and 5) although there was a spread of over 10° in Car B as compared to 5° in Car D (fan car). With a minimum of 56° in the bottom fruit in Car B, only one heater was removed while both heaters were removed from Car D which had a minimum of 63°. After the heaters were removed from Car D, fruit temperature dropped steadily resulting in a bottom doorway pulp temperature of 56° and a top of 57° upon arrival at Winnipeg. As the entire load was near the danger point one heater was installed as a protection until unloading could be completed. In general, temperatures rose rapidly after two heaters were lit in each car with fairly high maximums and wide temperature spreads in the non-fan cars. Temperatures dropped rapidly after removal of heaters.

Alcohol Heaters

The operation of the alcohol heaters was generally satisfactory. An unexplained burner failure was observed when one heater was found not burning at the pre-unloading inspection at Winnipeg. This heater had been on pilot at the previous inspection. There were also two instances of what appeared to be improperly calibrated thermostats. As previously noted, the thermostats were set at 57 1/2° F. for the first part of the heating period and then reset to 60° for approximately the last 42 hours to raise fruit temperatures for unloading.

In Car E (non-fan) both heaters were observed on full burning at all inspections indicating that the air temperature at the ice grates (thermostat level) was below the thermostat setting. This is substantiated by temperature readings made beneath the ice grates in the bunkers and in the lading space at the bottom bulkhead centerline position (table 6). In Car F (fan car) the heaters were observed on pilot a number of times (table 17) although the bottom bunker and BBCL air temperature readings (table 8) do not show temperatures above the thermostat setting. It is probable that fan action while the car was moving maintained a higher temperature at the heater thermostat level than that indicated by the resistance thermometers, which were read after the car had stopped. Because of the longer full burning of the heaters in Car E, temperatures were considerably above those in Car F (figs. 6 and 7) with a much greater spread between top and bottom averages. The fan action in Car F reduced the amount of full burning time as indicated by the heater record (see fig. 7) and also resulted in a more uniform fruit temperature.

Fruit temperatures in the top layer of Car G were raised only 3° during the heating period due in part to the heaters being on pilot for a considerable part of the time as observed at several of the inspections although car temperatures were well below the thermostat setting. A short heating period is also indicated by the small amount of fuel consumed (table 18). As both bottom fruit and air temperatures were fairly low in spite of operation of fans (table 9) it must be assumed that the thermostats were not functioning properly. Because of the low temperature of fruit in the bottom layer, the alcohol heaters were replaced with one charcoal heater in Winnipeg to insure protection prior to unloading. However, bottom layer temperatures continued to drop while the car was standing. It should be noted that this car had self sealing drains that permitted a minimum of cold air to enter the bunkers as compared with

cars E and F with open drains. This feature coupled with the fact that the car had 4 to 4 1/2" of insulation as compared with 3 to 3 1/2 inches in cars A to F indicates that the low temperature was caused by faulty operation of the heaters.

Car H was cooled considerably more than any of the other test cars during the ventilation period. As it was of a different series and ownership, the greater cooling may have been due to the design of the hatches which had integral plugs and may have permitted a greater volume of air to enter the car. As a result, fruit and air temperatures in the bottom layers were the lowest of any car when the heating period started. A minimum of 29° F. air temperature was recorded in the rear bunker at Fargo, N.D. The low temperature was undoubtedly due to the drains being left open although it would be expected that the external trap type drain installed on this car would obstruct the flow of cold air to the bunker much more than the straight open pipe of cars E or F. Within the loading space of the car an air temperature of 53° was recorded near the floor-rack at the bulkhead when the bunker was 29° F. (table 10). Both heaters were on full burning for practically the entire heating period resulting in the highest fuel consumption, 14.35 gals., of any of the alcohol heater cars (table 19). As top layer temperatures had reached 65° at Grand Forks the car fans were placed "on" for the balance of the trip in order to equalize somewhat top and bottom fruit temperatures prior to unloading (fig. 9). During this period one heater went on pilot briefly due to warm air circulated past the heaters by the fans.

Summarizing, car temperatures rose more slowly with the alcohol heaters in non-fan cars than in fan cars, and more uniform temperatures and reduced heater operation (burning) were possible because of better thermostatic control under forced air circulation. Low bottom layer temperatures occurred in one fan car due apparently to improperly calibrated thermostats.

Underslung Heater

Temperatures in car J during the ventilation period were similar to those in most of the other test cars. The underslung heater was fueled and lit at St. Paul and the damper was set at position 4 and was not changed enroute to destination. Banana temperatutes were very uniform and the car average did not vary more than two degrees throughout the heating period (fig. 10). Estimated fuel consumption was 80 lbs. of charcoal briquets (table 17). Fans were in the ON position which aided in maintaining uniform temperatures. The performance of this car was the most satisfactory of any in the test.

Drains open or closed.

One of the objectives of this test was to determine the effects of open drains on banana temperatures. Resistance thermometers were placed at the bottom of each bunker above the drip pan (bottom bunker air) and just above the floor rack at each bulkhead in the loading space (BBCL air). Both positions were at the centerline of the car. It was believed that these two positions would show the effect of any cold air that might enter the car through the open drains. A study of the air temperature data for the charcoal heater cars (A,B,C&D) shows that, while temperatures in the bottom of

the bunker and under the floor rack at the doorway were lower when the drains were open, the air in the loading space above the floor racks at the bulkhead (BBCL air) was not affected to any marked degree. The curves in fig. 11 show the temperatures at each of these 3 locations for all four cars and a comparison between cars for air temperatures 3 inches above the floor racks at the bulkhead (BBCL) is shown in the curves in Figure 12. This gives a comparison for the non-fan cars with the fan cars; also, between fan and non-fan cars, both with drains open and plugged. The curves show practically no difference in fan or non-fan cars with drains open or plugged during both ventilation and heating. As will be noted in fig. 12 B and C, at the bottom of the bulkhead air temperatures were consistently higher in the fan cars, which indicates that there was even less danger to the load from cold air when fan cars are used. It should be noted that during the preparation of cars A to F for the test, all the drain caps were thrown back leaving the top of the drain pipe in the bunker exposed. This was not discovered until the regular heater inspection at Grand Forks. The caps were all replaced at this point except for one each that were missing in cars C and F. While having the caps off represents the extreme condition insofar as movement of cold air into the bunker is concerned it is believed that it did not have very much effect on the heater performance or car temperature.

None of the drains were plugged in the alcohol heater cars (E,F,G&H) except that Car G had the self-sealing drains and car H the external trap. Air temperatures in the bunker and at the floor-racks next to the bulkhead in cars E, F and G followed closely the pattern of the corresponding charcoal heater cars as previously discussed. The use of self-sealing drains in car G did not result in higher bunker air temperatures. This may have been influenced somewhat by the greater pilot burning time of the heaters in car G because of the apparently faulty thermostat calibration previously pointed out. In car H (non-fan), bottom air temperatures were lower than any other car at the start of the heating period because of greater cooling during ventilation. Bottom bunker air was 29° F. at Fargo and because of a 52° bottom doorway banana temperature, it was considered advisable to plug the drains at this point as a precaution against the possibility of chilling bottom layer fruit.

Car Fans

Forced air circulation by car fans resulted in more uniform fruit temperatures both under ventilation and heat with lower maximums and higher minimums. Bottom air temperatures were considerably higher with drains open in fan cars than in non-fan cars and thermostatic control of the alcohol heaters was more effective. The fans did not appear to impair the burning of either the alcohol or charcoal heaters. When fan cars are available for loading bananas they should be moved with the fans on during ventilation or heater service.

Gas Analysis

In the first part of the test between New Orleans and Memphis the cars with the drains plugged accumulated slightly higher amounts of carbon dioxide than the cars with open drains. See table 21 for complete record of gas analysis. After the vents were opened carbon dioxide was present in such small amounts that it could hardly be detected in the Chicago sampling. The heaters were lit at St. Paul and a build-up to a maximum amount of carbon

dioxide for the trip occurred in most of the cars upon arrival at Fargo. Car H continued to accumulate more carbon dioxide after leaving Fargo but this can be attributed to the plugging of the drains at this point. The run between St. Paul and Fargo was the longest period during which the cars were closed thus allowing the greatest accumulation of carbon dioxide. The removal of charcoal heaters from some of the cars at Fargo caused a rapid decrease in the carbon dioxide content in these cars. The low concentration of carbon dioxide in car J was due to the fact that all products of fuel combustion from the underslung heater did not enter the car leaving only the respiration of the fruit to influence the composition of air in the car. Throughout most of the trip up to Fargo the fan cars showed somewhat lower concentrations of carbon dioxide than the non-fan cars. The fans probably prevented the carbon dioxide, which is slightly heavier than air, from accumulating at the lower level where the samples were taken. These differences are noted when car B is compared with car D and car E with car F. The only comparison of bunker air samples with doorway samples was obtained in car F which had fans and open drains. The bunker samples in this instance had a lower carbon dioxide and a higher oxygen content than the doorway samples indicating that some fresh air was entering through the open drains. The carbon dioxide level of the air did not reach high enough concentrations in any of the cars to have any noticeable effect on ripening.

The oxygen content followed a close inverse relationship to carbon dioxide in most cars. The low point in oxygen level was not considered sufficiently low to have much influence on either the bananas or the heater operation.

The carbon monoxide data show that the concentration as measured by this method, reached proportions extremely toxic to man in the portable charcoal heater cars. No carbon monoxide could be detected in the alcohol heater cars or the underslung heater car.

No close relationship was found between the composition of the air in the cars during transit and the ripeness of the bananas at unloading time.

General Discussion

During unloading a check of the condition of the bananas was made in each car by observing the number of ripe and turning stems (See table 2). As temperature is the controlling factor in ripening an attempt was made to correlate fruit temperatures in transit with ripeness of fruit upon unloading. In fig. 13 the number of hours in transit during which the average load temperature was above 60° is shown graphically with the percentage of ripe and turning fruit for each car. Car C had the longest heating period and greatest number of hours above 60° F. and the highest percentage of ripes and turnings while cars G and J had no temperatures over 60° and hence had the lowest ripening in transit. Between these two extremes there was little relationship between temperatures and ripeness in the test cars. It should be noted that the heating factor for each car was influenced mostly by the length of time the heaters were burning and since this varied considerably between cars there does not appear to be well defined relationships between air circulation, open or closed drains or type of heater and ripening.

Summary of Results

The use of two charcoal heaters per car under the conditions of the test resulted in a greater heat output than was required as evidenced by high commodity temperatures after only 18 hours burning, especially in a non-fan car with drains open. Of the five cars showing the highest percentage of ripes and turnings at destination, four were charcoal heaters.

The alcohol heaters were generally satisfactory although there was evidence of improper calibration of thermostats in one car. Better thermostat control was effected by use of forced air circulation. Heat output of two heaters per car was satisfactory under conditions of test.

The underslung heater in a fan car gave best performance from standpoint of operation, fruit temperature and condition at destination.

Leaving drains open in cars heated with charcoal heaters did not result in lower fruit or air temperatures in the loading space. There was some evidence that open drains may have increased the burning rate of heaters somewhat. With forced air circulation there was less danger of possible low air temperatures in the car from leaving drains open. Bottom air temperatures in cars with the self-sealing drain or the external trap drain were no better than in cars with open drains.

The maximum concentration of carbon dioxide (3.6%) and the lowest concentration of Oxygen (16.3%) were encountered in the test cars for only a short time and had no noticeable effect on the fruit.

Forced air circulation gave better performance for both types of heaters with more uniform fruit temperature, lower maximums and higher minimums than in standard non-fan cars.

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Members of the test party were:

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R. J. Schulz, " " "	New York	" " "
H. L. Voorhees, Assn. Am. RRs.	Chicago	" " "
J. E. Ballard, Illinois Central Railroad	Chicago	" " to E. Dubuque
P. H. Heinze, USDA	Beltsville, Md.	" " Winnipeg
W. H. Redit, USDA	" "	" " "
H. R. Hudgens, CB&QRR	Chicago	E. Dubuque to Winnipeg
G. J. Jaeger, Burlington Refrig. Express Co.	Indiana Harbor., Ind.	" " " "
T. P. Guthrie, Fruit Dispatch Co.	Minneapolis	St. Paul " "

Table 1
Inspection Record of Doorway Pulp Temperatures 1/

Place	Date	Outside Air		Car A		B		C		D		E		F		G		H		J	
	Jan.	Arrival	Depart	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.	Top	Bot.
New Orleans	17	-	62°	56.5	56.5	56.5	56	56.5	56	57	56	57	56	58	56	58	56	57.5	56	57.5	56.5
Jackson	17	57°	57°	58	57	58	57	58	57	58	57.5	57.5	57.5	58	57	57.5	57	58	57	57.5	57
Memphis	17	62°	62°	58	58	58	57.5	59	59	58.5	58.5	58	57.5	59	59	59	58	58	58	58	58
Fulton	18	56°	53°	60	59	60	58	60	60	60	59.5	60	58	60.5	60	60.5	59.5	60	58.5	60	59
Bluford	18	48°	48°	59	57.5	59	57.5	59.5	59.5	59.5	59.5	59	59.5	60	59.5	59	59	59	58	59	59
Chicago	19	42°	42°	57	55	57.5	55	58	57.5	57.5	57.5	59.5	55	58	58	58	57.5	57	55	58	57
Hawthorne	19	44°	44°	57	55	57.5	55.5	58	58	57.5	57.5	57.5	55	58	58	57	57.5	57	55	57.5	57.5
E. Dubuque	20	24°	24°	56	55	56.5	56	57	57	57.5	57.5	56	54.5	57	57.5	56.5	57	56	54	56	56.5
St. Paul	20	13°	0°	55	54	55.5	55	56	56	56	56	54.5	53.5	58.5	55.5	55	55.5	54.5	53.5	55	55
Fargo	21	-24°	-16°	69	57	61	56.5	62	61.5	61	63	57	53	55.5	56	55.5	55	58.5	52	56	55.5
Grand Forks	21	-10°	2°	64	55	60	58	62	61.5	60.5	60	57.5	55	56	55	54	55	59	52	55	58
Noyes	22	8°	9°	60	56.5	61	58	61	62	58	56	60	56	58	57	56.5	56	60	54	56.5	57
Winnipeg	22	6°	-	60	57	61	57	62.5	62	57	56	62	54	58.5	58	57	55	60	57	56	56
"	23	11°	-	56	53.5	60	53	63	60	61	60	69	60	62	59	57	53	65	60	55	56

1/ Temperatures obtained with hand thermometers during regular fruit inspection.

Table No. 2
Loading and Unloading Data

Car No.	A-IC 50187	B-IC 50071	C-IC 50189	D-IC 50114	E-IC 50163
Consignee & Destination	Macdonalds Consolidated, Ltd. Winnipeg	Macdonalds Consolidated, Ltd. Winnipeg	Rogers Fruit Co. Winnipeg	Rogers Fruit Co. Winnipeg	Cran-Mowat-Drever Ltd. Winnipeg
Variety 1/	Guatemala	Guatemala	Guatemala	Guatemala	Guatemala
Size	Light nines	Light nines	Medium nines	Medium nines	Light nines
No. stems	295	302	242	246	297
Av. Wt. (lbs.)	72.6	70.8	88.4	86.3	72.5
Type of load	1 1/2 tier	1 1/2 tier	1 tier	1 tier	1 1/2 tier
No. stems top layer	8 x 8	6 x 6, 5 x 5	None	None	7 x 7
Load wt. (Net lbs.)	21.410	21.390	21.390	21.240	21.525
Loading - begun	9:30 AM	8:30 AM	9:30 AM	8:30 AM	10:00 AM
(Jan. 17) finished	10:10 AM	9:25 AM	10:10 AM	9:25 AM	10:50 AM
Av. fruit temp.	56°	56°	56°	56°	56°
Av. outside temp.	58°	53°	58°	53°	62°
Unloading - begun	10:50 AM	9:50 AM	7:20 AM	8:15 AM	7:10 AM
(Jan. 23) finished	11:45 AM	10:45 AM	8:00 AM	9:10 AM	7:45 AM
Ar. fruit temp. 2/	56.7°	59.9°	62.5°	60.8°	67.7°
Ar. outside temp.	11°	11°	10°	10°	10°
No. of turnings	54	29	102	40	20
No. of ripes	10	6	11	11	5

1/ Guatemala produced - S S Chiriqui - Jan. 17, New Orleans.
2/ Fruit temperature from final resistance thermometer reading at 7:00 AM except car H at 9:30 AM

Table No. 2 (Continued)

Car No.	F-IC 50190	G-IC 51000	H-NRC 18464	J-IC 50426
Consignee & Destination	Rusen Fruit Co. Winnipeg	Scott Fruit Co. Winnipeg	Western Growers Ltd. Winnipeg	Crescent Fruit Co. Winnipeg
Variety 1/	Guatemala	Guatemala	Guatemala	Guatemala
Size	Light nines	Medium nines	Medium nines	Medium nines
No. Stems	300	257	255	249
Av. Wt. (lbs.)	71.0	83.7	84.5	83.6
Type of load	1 1/2 tier	1 tier	1 tier	1 tier
No. stems top layer	7 x 7	None	None	None
Load Wt. (Net lbs.)	21.305	21.525	21,545	20,830
Loading - begun	10:50 AM	10:00 AM	10:50 AM	10:40 AM
(Jan. 17) finished	11:55 AM	10:50 AM	11:50 AM	11:25 AM
Av. fruit temp.	56°	56°	56°	56°
Av. outside temp.	65°	62°	65°	63°
Unloading - begun	2:40 PM	1:45 PM	1:30 PM	1:10 PM
(Jan. 23) finished	3:40 PM	2:45 PM	4:30 PM	3:15 PM
Ar. fruit temp. 2/	62°	57.3°	63.9°	55.2°
Av. outside temp.	6°	6°	8°	5°
No. of turnings	34	19	57	10
No. of ripes	4	1	12	0

Table No. 3

Corrected Air and Commodity Temperatures

Car No. A 1C 50187
NON FAN - CHARCOAL - DRAINS OPEN

Station	Date Jan.	Time	OST °F	TBCL R 1/	TDCL	TBCL H 2/	BBCL R 1/	BDCL	BBCL H 2/	AIR Bunker R 1/	AIR Bunker H 2/	AIR BBCL R 1/	AIR BBCL H 2/	AIR TDCL	AIR BDCL	MAX	MIN	AVE. TOPS	AVE. BOTT.
New Orleans	17							Loaded 9:30 - 10:10AM											
"	17	4P	71	605	570	585	550	570	565	570	570	565	560	580	560	60.5	55.0	58.7	56.2
Jackson	18	2:30A	57	620	585	600	560	575	575	580	580	575	570	585	565	62.0	56.0	60.2	57.0
Memphis	18	11:30A	62	615	585	605	575	580	580	585	585	580	575	585	575	61.5	57.5	60.2	57.8
"	18	11:30A	62					Rear Vents on irons - 2" open											
Fulton	18	7P	56	640	605	630	575	590	585	600	600	590	580	615	580	64.0	57.5	62.5	58.3
"	18	7P	56					Rear Vents Open Full - 10"											
Bluford	19	3A	47	630	575	600	575	580	580	575	555	585	565	610	585	63.0	57.5	60.2	57.8
Chicago	19	2P	47	605	580	590	555	565	555	550	520	560	530	570	530	60.5	55.5	59.2	55.8
"	19	2P	47					Vents Closed - Car reversed											
Hawthorne	19	8:30P	44	615	580	595	555	570	555	560	555	565	550	570	540	61.5	55.5	59.7	56.0
E. Dubuque	20	6A	24	605	575	610	555	565	560	530	540	555	550	560	535	61.0	55.5	59.7	55.7
St. Paul	20	4P	13	595	565	580	545	555	550	505	515	540	530	545	510	59.5	54.5	58.0	55.0
"	20	5P	13					One heater lit each Bunker											
Fargo	21	8A	-24	815	700	790	600	580	595	430	480	605	590	830	530	81.5	58.0	76.8	59.2
"	21	9A	-16					Heaters removed											
Grand Forks	21	3P	-10	700	665	700	565	580	585	455	520	550	560	650	480	70.0	56.5	68.8	57.7
"	21	4P	--					Drains plugged											
Noyes	22	5A	6	655	620	645	555	565	565	535	540	560	550	600	455	65.5	55.5	64.0	56.2
Winnipeg	22	11:30A	6	640	610	630	555	560	555	525	525	555	540	585	445	64.0	55.5	62.7	55.7
"	23	7A	10	610	575	605	535	540	535	525	520	535	525	565	440	61.0	53.5	59.7	53.7
"	23							Unloaded 10:50 - 11:45AM											

1/ Head end New Orleans to Markham - car reversed - Rear Markham to Winnipeg.

2/ Rear end New Orleans to Markham - car reversed - Head Markham to Winnipeg.

Table No. 4

Corrected Air and Commodity Temperatures

Car No. B 1C 50071
NON FAN - CHARCOAL - DRAINS PLUGGED

Station	Date Jan.	Time	OST °F	TBCL R 1/	TDCL	TBCL H 2/	BBCL R 1/	BDCL	BBCL H 2/	AIR Bunker R 1/	AIR Bunker H 2/	AIR BBCL R 1/	AIR BBCL H 2/	AIR TDCL	AIR BDCL	MAX	MIN	AVE. TOPS	AVE. BOTT.
New Orleans	17							Loaded 8:30 - 9:25AM											
"	17	4P	71	575	565	570	570	560	575	570	565	565	565	585	570	57.5	56.0	57.0	56.8
Jackson	18	2:30A	57	590	575	590	570	565	580	580	590	575	575	595	580	59.0	56.5	58.5	57.2
Memphis	18	11:30A	62	590	580	585	580	575	585	585	595	580	580	590	585	59.0	57.5	58.5	58.0
"	18							Rear Vents on irons - 2" open											
Fulton	18	7P	56	615	595	615	585	585	595	595	600	585	590	620	590	61.5	58.5	60.8	58.8
"	18	7P	56					Rear Vents Full Open - 10"											
Bluford	19	3A	47	605	590	600	585	580	595	585	585	580	570	600	580	60.5	58.0	59.8	58.7
Chicago	19	2P	47	590	580	585	570	560	570	555	520	560	535	580	550	59.0	56.0	58.5	56.7
"	19	2P	47					Vents Closed - Car reversed											
Hawthorne	19	8:30P	44	590	575	585	570	565	575	565	560	565	560	580	560	59.0	56.5	58.3	57.0
E. Dubuque	20	6A	24	58.5	57.0	58.0	57.0	555	580	555	560	560	560	570	555	58.5	55.5	57.8	56.8
St. Paul	20	4P	13	57.5	560	575	560	550	570	540	---	550	550	560	540	57.5	55.0	57.0	56.0
"	20	5P	13					One Heater lit each Bunker											
Fargo	21	8A	-24	660	620	675	590	565	610	530	590	585	590	685	550	67.5	56.5	65.2	58.8
"	21	9A	-16					Rear Heater Removed											
Grand Forks	21	3P	-10	645	630	675	580	565	630	565	575	565	610	675	530	67.5	56.5	65.0	59.2
Noyes	22	5A	6	635	630	675	570	560	635	565	580	560	595	660	520	67.5	56.0	64.7	58.8
Winnipeg	22	11:30A	6	645	640	690	575	560	640	565	585	560	605	675	520	69.0	56.0	65.8	59.2
"	22	1 Noon	6					Front Heater Removed											
"	23	7A	10	620	625	635	580	550	580	565	570	565	560	610	480	63.5	55.0	62.7	57.0
"	23							Unloaded 9:50 - 10:45AM											

1/ Head end New Orleans - Markham - car reversed - Rear to Winnipeg.

2/ Rear end N. O. to Markham, car reversed, Head to Winnipeg.

Table No. 5

Corrected Air and Commodity Temperatures

Car No. C 1C 50189
FAN CAR - CHARCOAL - DRAINS OPEN

Station	Date Jan	Time	OST °F	TBCL R 1/	TDCL	TBCL H 2/	BBCL R 1/	BDCL	BBCL H 2/	AIR Bunker R 1/	AIR Bunker H 2/	AIR BBCL R 1/	AIR BBCL H 2/	AIR TDCL	AIR BDCL	MAX	MIN	AVE. TOPS	AVE. BOTT.
New Orleans	17							Loaded 9:30 - 10:10AM											
"	17	4P	71	565	565	560	565	560	570	575	565	565	570	580	575	57.0	56.0	56.3	56.5
Jackson	18	2:30A	57	580	580	580	575	580	580	585	580	580	585	590	585	58.0	57.5	58.0	57.8
Memphis	18	11:30A	62	590	585	585	585	590	590	590	585	590	590	600	595	59.0	58.5	58.7	58.8
"	18	11:30A	62					Rear Vents on irons - 2" open											
Fulton	18	7P	56	605	600	600	600	605	605	605	600	600	605	620	605	60.5	60.0	60.2	60.3
"	18	7P	56					Rear Vents Full Open - 10"											
Bluford	19	3A	47	600	595	585	600	600	600	590	570	600	600	605	600	60.0	58.5	59.3	60.0
Chicago	19	2P	47	585	580	570	595	580	585	580	545	595	580	590	585	59.5	57.0	57.8	58.7
"	19	2P	47					Rear Vents Closed - plugs attached - car reversed											
Hawthorne	19	8:30P	44	580	575	570	595	580	585	575	570	585	580	595	590	59.5	57.0	57.5	58.7
E. Dubuque	20	6A	24	585	570	575	590	580	590	555	540	585	580	590	585	59.0	57.0	57.7	58.7
St. Paul	20	4P	13	570	560	565	580	565	580	545	520	575	570	575	575	58.0	56.0	56.5	57.5
"	20	5P	13					One heater lit each bunker - Vents closed											
Fargo	21	8A	-24	650	615	645	640	625	635	530	515	640	635	690	610	65.0	61.5	63.7	63.3
"	21	9A	-16					Rear Heater removed											
Grand Forks	21	3P	-10	63.0	620	655	640	625	650	560	525	605	630	685	600	65.5	62.0	63.5	63.8
Noyes	22	5A	6	620	615	650	630	620	660	575	560	610	645	660	610	66.0	61.5	62.8	63.7
Winnipeg	22	11:30A	6	625	610	660	640	625	660	585	560	605	645	675	---	66.0	61.0	63.2	64.2
"	22	12 Noon						Front Heater removed											
"	23	7A	10	625	615	640	635	630	605	585	540	600	580	640	560	64.0	60.5	62.7	62.3
"	23							Unloaded 7:20 - 8:00AM											

1/ Head end N. O. to Markham - car reversed - Rear to Winnipeg.

2/ Rear end N. O. to Markham - car reversed - Head to Winnipeg.

Table No. 6

Corrected Air and Commodity Temperatures

Car No. D 1C 50114
FAN CAR - CHARCOAL - DRAINS PLUGGED

Station	Date Jan.	Time	OST °F	TBCL R 1/	TDCL	TBCL H 2/	BBCL R 1/	BDCL	BBCL H 2/	AIR Bunker R 1/	AIR Bunker H 2/	AIR BBCL R 1/	AIR BBCL H 2/	AIR TDCL	AIR BDCL	MAX	MIN	AVE. TOPS	AVE. BOTT.
New Orleans	17							Loaded 8:30 - 9:25AM											
"	17	4P	71	570	570	565	560	560	565	570	565	565	565	575	565	57.0	56.0	56.8	56.2
Jackson	18	2:30A	57	585	585	580	575	580	580	585	585	585	580	580	585	58.5	57.5	58.3	57.8
Memphis	18	11:30A	62	595	590	590	585	585	590	595	590	595	590	585	595	59.5	58.5	59.2	58.7
"	18	11:30A	62					Rear Vents on irons - open 2"											
Fulton	18	7P	56	615	610	605	600	600	605	610	605	610	605	615	605	61.5	60.0	61.0	60.2
"	18	7P	56					Rear Vents Full Open - 10"											
Bluford	19	3A	47	610	600	590	605	590	595	605	570	610	595	600	595	61.0	59.0	60.0	59.7
Chicago	19	2P	47	595	580	570	595	575	575	590	555	605	575	580	580	59.5	57.0	58.2	58.2
"	19	2P						Rear Vent Closed - plugs attached - car reversed											
Hawthorne	19	8:30P	44	590	580	575	595	575	580	585	570	595	580	580	585	59.5	57.5	58.2	58.3
E. Dubuque	20	6A	24	590	580	575	590	575	585	570	560	595	575	575	580	59.0	57.5	58.2	58.3
St. Paul	20	4P	13	575	570	570	580	565	575	560	550	585	570	560	575	58.0	56.5	57.2	57.3
"	20	5P	13					One heater lit each bunker - Vents closed											
Fargo	21	8A	-24	665	635	655	655	630	660	620	590	700	645	685	615	66.5	63.0	65.2	64.8
"	21	9A	-16					Both Heaters Removed											
Grand Forks	21	3P	-10	630	615	620	630	610	625	570	555	620	595	600	585	63.0	61.0	62.2	62.2
Noyes	22	5A	6	585	580	575	590	570	590	560	545	640	575	570	575	59.0	57.0	58.0	58.3
Winnipeg	22	11:30A	6	580	565	560	585	565	570	540	530	610	565	555	565	58.5	56.0	56.8	57.3
"	22	12 Noon	6					One heater installed front bunker											
"	23	7A	10	610	610	655	570	585	615	545	500	630	585	655	540	65.5	57.0	62.5	59.0
"	23							Unloaded 8:15 - 9:10AM											

1/ Head end New Orleans to Markham - Rear Markham to Winnipeg - car reversed.

2/ Rear end N. O. to Markham - Head end Markham to Winnipeg.

Table No. 7

Corrected Air and Commodity Temperatures

Car No. E 1C 50163
NON FAN CAR - ALCOHOL - DRAINS OPEN

Station	Date Jan.	Time	OSA °F	TBCL R 1/	TDCL	TBCL H 2/	BBCL R 1/	BDCL	BBCL H 2/	AIR Bunker R 1/	AIR Bunker H 2/	AIR BBCL R 1/	AIR BBCL H 2/	AIR TDCL	AIR BDCL	MAX	MIN	AVE. TOPS	AVE. BOTT.
New Orleans	17							Loaded 10:00 - 10:50AM											
"	17	4P	71	560	565	575	565	565	560	560	555	565	565	575	555	57.5	56.0	56.7	56.3
Jackson	18	2:30A	57	580	575	590	570	570	565	585	580	585	580	585	570	59.0	56.5	58.2	56.8
Memphis	18	11:30A	62	580	580	590	585	575	575	585	585	585	585	585	580	59.0	57.5	58.3	57.8
"	18	11:30A	62					Rear Vents on irons - open 2"											
Fulton	18	7P	56	600	595	615	590	585	580	600	600	620	590	610	585	61.0	58.0	60.3	58.5
"	18	7P	56					Rear Vents Full Open - 10"											
Bluford	19	3A	47	595	590	600	600	580	575	575	560	590	575	590	575	60.0	57.5	59.5	58.5
Chicago	19	2P	47	575	575	580	580	560	550	550	530	575	540	565	540	58.0	55.0	57.7	56.3
"	19	2P	47					Vents Closed - car reversed											
Hawthorne	19	8:30P	44	58.0	575	585	580	565	555	560	565	590	560	570	550	58.5	55.5	58.0	56.7
E. Dubuque	20	6A	24	57.5	565	580	590	560	555	540	545	585	555	560	545	59.0	55.5	57.3	56.8
St. Paul	20	4P	13	565	555	570	595	550	550	525	520	570	535	545	525	59.5	55.0	56.3	56.5
"	20	5P	13					One Heater lit each bunker - Thermostat setting 57 1/2°											
Fargo	21	8A	-24	610	585	625	620	560	555	340	350	570	540	660	500	62.5	55.5	60.7	57.8
Grand Forks	21	3P	-10	630	595	650	610	560	560	390	370	575	545	700	485	65.0	56.0	62.5	57.7
"	21	4P	--					Thermostat re-set 60°											
Noyes	22	5A	6	660	625	685	625	565	570	400	385	580	545	715	470	68.5	56.5	65.7	58.7
Winnipeg	22	11:30A	6	670	635	710	650	570	580	400	385	580	550	745	480	71.0	57.0	67.2	60.0
"	23	7A	10	725	675	730	740	590	600	470	485	600	590	765	480	74.0	59.0	71.0	64.3
"	23	--	--					Unloaded 7:10 - 7:45AM											

1/ Head end New Orleans to Markham - car reversed - Rear Markham to Winnipeg.

2/ Rear end New Orleans to Markham - car reversed - Head Markham to Winnipeg.

Table No. 8

Corrected Air and Commodity Temperatures

Car No. F 1C 50190
FAN CAR - ALCOHOL - DRAINS OPEN

Station	Date Jan.	Time	OST °F	TBCL R 1/	TDCL	TBCL H 2/	BBCL R 1/	BDCL	BBCL H 2/	AIR Bunker R 1/	AIR Bunker H 2/	AIR BBCL R 1/	AIR BBCL H 2/	AIR TDCL	AIR BDCL	MAX	MIN	AVE. TOPS	AVE. BOTT.
New Orleans	17							Loaded 10:50 - 11:55AM											
"	17	4P	71	570	575	580	595	570	570	565	560	555	560	570	560	59.5	57.0	57.5	57.8
Jackson	18	2:30A	57	580	585	590	595	585	585	595	580	565	575	575	585	59.5	58.0	58.5	58.8
Menphis	18	11:30A	62	595	590	600	595	590	595	600	590	575	585	585	595	60.0	59.0	59.5	59.3
"	18	11:30A	62					Rear Vents on Irons - Open 2"											
Fulton	18	7P	56	610	610	620	600	605	610	615	605	590	600	610	605	62.0	60.0	61.3	60.5
"	18	7P	56					Rear Vents Full Open - 10"											
Bluford	19	3A	47	605	600	605	605	605	605	600	570	590	595	595	605	60.5	60.0	60.3	60.5
Chicago	19	2P	47	590	575	585	595	590	585	595	550	575	575	575	585	59.5	57.5	58.3	59.0
"	19	2P	47					Rear Vents Closed - plugs attached - car reversed											
Hawthorne	19	8:30P	44	585	580	585	595	590	585	575	565	570	575	570	585	59.5	58.0	58.3	59.0
E. Dubuque	20	6A	24	580	580	590	590	585	585	545	530	565	575	565	580	59.0	58.0	58.3	58.7
St. Paul	20	4P	13	565	565	580	575	570	580	530	535	555	565	550	570	58.0	56.5	57.0	57.5
"	20	5P	13					One heater lit each Bunker - Thermostat setting 57 1/2° - Vents Closed											
Fargo	21	8A	-24	585	575	590	585	580	585	495	490	565	570	570	575	59.0	57.5	58.3	58.3
Grand Forks	21	3P	-10	585	570	585	580	575	575	445	475	555	555	640	575	58.5	57.0	58.0	57.7
"	21	4P	--					Thermostats re-set to 60°											
Noyes	22	5A	6	605	590	610	590	590	585	545	515	570	570	640	565	61.0	58.5	60.2	58.8
Winnipeg	22	11:30A	6	615	590	605	595	590	590	545	530	575	575	645	565	61.5	59.0	60.3	59.2
"	23	7A	10	655	625	645	605	605	585	480	555	565	575	710	535	65.5	58.5	64.2	59.8
"	23							Unloaded 2:40 - 3:40PM											

1/ Head end New Orleans to Markham - car reversed - Rear Markham to Winnipeg

2/ Rear end New Orleans to Markham - car reversed - Head Markham to Winnipeg

Table No. 9

Corrected Air and Commodity Temperatures

Car No. G 1C 51000
FAN CAR - ALCOHOL - SELF-SEALING DRAINS

Station	Date Jan.	Time	OST °F	TBCL R 1/	TDCL	TBCL H 2/	BBCL R 1/	BDCL	BBCL H 2/	AIR Bunker R 1/	AIR Bunker H 2/	AIR BBCL R 1/	AIR BBCL H 2/	AIR TDCL	AIR BDCL	MAX	MIN	AVE. TOPS	AVE. BOTT.
New Orleans	17							Loaded 10:00 - 10:50AM											
"	17	4P	71	580	575	580	560	560	560	565	565	560	560	595	565	58.0	56.0	57.8	56.0
Jackson	18	2:30A	57	580	580	585	575	575	580	575	580	575	575	585	585	58.5	57.5	58.2	57.7
Memphis	18	11:30A	62	590	590	595	585	585	590	585	590	585	585	595	590	59.5	58.5	59.2	58.7
"	18	11:30A	62					Rear Vents on irons - open 2"											
Fulton	18	7P	56	585	580	585	580	575	575	585	575	580	580	595	585	58.5	57.5	58.3	57.7
"	18	7P	56					Rear Vents full open - 10"											
Bluford	19	3A	47	600	600	590	605	595	595	595	575	595	585	600	590	60.5	59.0	59.7	59.8
Chicago	19	2P	47	585	585	570	590	580	565	575	550	585	565	585	575	59.0	56.5	58.0	57.8
"	19	2P	47					Rear Vents closed - plugs attached - car reversed											
Hawthorne	19	8:30P	44	585	585	575	600	580	570	570	565	575	565	585	575	60.0	57.0	58.2	58.3
E. Dubuque	20	6A	24	575	580	575	580	575	575	550	550	570	560	575	560	58.0	57.5	57.7	57.7
St. Paul	20	4P	13	560	570	570	565	570	570	535	545	555	560	565	545	57.0	56.0	56.7	56.8
"	20	5P	13					One heater lit each bunker - Thermostats setting 57 1/2° Vents closed											
Fargo	21	8A	-24	570	570	575	565	560	565	520	525	550	555	565	520	57.5	56.0	57.2	56.3
Grand Forks	21	3P	-10	570	575	580	550	550	560	445	465	530	545	570	495	58.0	55.0	57.5	55.3
"	21	4P						Thermostats re-set to 60°											
Noyes	22	5A	6	585	585	590	580	550	560	505	520	550	555	600	520	59.0	55.0	58.7	56.3
Winnipeg	22	11:30A	6	605	595	600	570	555	560	510	520	550	555	615	525	60.5	55.5	60.0	56.2
"	22	12 Noon -						Alchol heaters extinguised - one charcoal heater installed and lit in front bunker											
"	23	7A	10	580	600	625	540	535	555	515	475	530	535	610	515	62.5	53.5	60.2	54.3
"	23							Unloaded 1:45 - 2:45PM											

1/ Head end New Orleans to Markham - car reversed - Rear Markham to Winnipeg.

2/ Rear N. O. to Markham - car reversed - Head to Winnipeg.

Table No. 10

Corrected Air and Commodity Temperatures

Car No. H NRC 18464
FANS OFF - ALCOHOL - EXTERNAL TRAP DRAINS

Station	Date Jan.	Time	OST °F	TBCL R 1/	TDCL	TBCL H 2/	BBCL R 1/	BDCL	BBCL H 2/	AIR Bunker R 1/	AIR Bunker H 2/	AIR BBCL R 1/	AIR BBCL H 2/	AIR TDCL	AIR BDCL	MAX	MIN	AVE. TOPS	AVE. BOTT.
New Orleans	17							Loaded 10:50 - 11:50AM											
"	17	4P	71	570	570	565	565	565	555	555	560	565	560	595	540	57.0	55.5	56.8	56.2
Jackson	18	2:30A	57	580	575	570	575	570	560	580	580	575	570	590	560	58.0	56.0	57.5	56.8
Memphis	18	11:30A	62	580	575	570	580	575	565	580	585	580	580	595	565	58.0	56.5	57.5	57.3
"	18	11:30A	62					Rear Vents on irons - open 2"											
Fulton	18	7P	56	605	595	595	585	590	570	595	605	585	590	625	580	60.5	57.0	59.8	58.2
"	18	7P	56					Rear Vents full open - 10"											
Bluford	19	3A	47	590	585	585	585	585	555	575	550	575	540	595	560	59.0	55.5	58.7	57.5
Chicago	19	2P	47	570	570	570	555	565	520	535	520	545	515	575	520	57.0	52.0	57.0	54.7
"	19	2P	47					Vents closed - car reversed											
Hawthorne	19	8:30P	44	575	570	570	560	565	540	545	555	555	550	575	530	57.5	54.0	57.2	55.5
E. Dubuque	20	6A	24	570	560	565	560	560	535	515	530	545	535	560	520	57.0	53.5	56.5	55.2
St. Paul	20	4P	13	555	545	555	540	555	520	485	490	530	500	550	490	55.5	52.0	55.2	53.8
"	20	5P	13					One heater lit each bunker. Thermostats setting 57 1/2°											
Fargo	21	8A	-24	625	590	620	535	555	545	290	300	530	515	670	450	62.5	53.5	61.2	54.5
"	21	9A	-16					Drains plugged											
Grand Forks	21	3P	-10	640	600	630	545	555	550	375	430	540	535	690	440	64.0	54.5	62.3	55.0
"	21	4P	-10					Thermostats re-set to 60°											
Noyes	22	5A	6	655	620	650	560	565	560	400	435	555	545	690	450	65.5	56.0	64.2	56.2
"	22	5A						Fans put on											
Winnipeg	22	11:30A	6	625	605	625	575	580	560	520	540	555	565	655	510	62.5	56.0	61.8	57.2
"	23	9:30A	12	680	655	675	600	615	610	435	490	600	595	705	500	68.0	60.0	67.0	60.8
"	23							Unloaded 1:30 - 4:00PM Heater extinguished 1:30PM											

1/ Head end New Orleans to Markham - car reversed - Rear Markham to Winnipeg.

2/ Rear end New Orleans to Markham - car reversed - Head Markham to Winnipeg.

Table No. 11

Corrected Air and Commodity Temperatures

Car No. J 1C 50426
FAN CAR - UNDERSLUNG HEATER - DRAINS PLUGGED

Station	Date Jan.	Time	OST °F	TBCL R 1/	TDCL	TBCL H 2/	BBCL R 1/	BDCL	BBCL H 2/	AIR Bunker R 1/	AIR Bunker H 2/	AIR BBCL R 1/	AIR BBCL H 2/	AIR TDCL	AIR BDCL	MAX	MIN	AVE. TOPS	AVE. BOTT.
New Orleans	17							Loaded 10:40 - 11:25AM											
"	17	4P	71	540	570	560	565	555	555	550	560	560	560	555	565	57.0	54.0	55.7	55.8
Jackson	18	2:30A	57	555	575	570	575	565	565	570	575	570	570	560	570	57.5	55.5	56.7	56.8
Memphis	18	11:30A	62	565	580	580	585	570	575	575	585	580	580	565	575	58.5	56.5	57.5	57.7
"	18	11:30A	62					Rear Vents on irons - open 2"											
Fulton	18	7P	56	585	605	595	595	585	585	590	600	595	590	590	590	60.5	58.5	59.5	58.8
"	18	7P	56					Rear Vents full open - 10"											
Bluford	19	3A	47	575	595	585	600	580	580	590	575	595	585	570	585	60.0	57.5	58.5	58.7
Chicago	19	2P	47	560	575	555	590	560	560	575	550	585	565	560	560	59.0	55.5	56.3	57.0
"	19	2P	47					Rear Vents closed - plugs attached - car reversed											
Hawthorne	19	8:30P	44	560	575	565	585	565	560	570	565	580	565	555	570	58.5	56.0	56.7	57.0
E. Dubuque	20	6A	24	55.5	570	565	580	565	565	550	550	570	565	550	565	58.0	55.5	56.3	57.0
St. Paul	20	4P	13	535	550	555	565	545	555	535	540	560	555	530	545	56.5	53.5	54.7	55.5
"	20	5P	13					Heater lit - Damper in No. 4 position - vents closed											
Fargo	21	8A	-24	560	565	570	580	560	570	575	575	580	575	545	555	58.0	56.0	56.5	57.0
Grand Forks	21	3P	-10	550	560	570	575	555	565	525	530	565	560	545	555	57.5	55.0	56.0	56.5
Noyes	22	5A	6	545	560	560	575	555	560	545	545	570	565	545	555	57.5	54.5	55.5	56.3
Winnipeg	22	11:30A	6	540	555	560	570	550	560	545	545	560	560	540	545	57.0	54.0	55.2	56.0
"	23	7A	10	540	560	555	550	565	540	515	510	550	535	550	540	56.5	54.0	55.2	55.2
"	23							Unloaded 1:10 - 3:15PM Heater extinguished											

1/ Head end New Orleans to Markham - car reversed - Rear Markham to Winnipeg.

2/ Rear end New Orleans to Markham - car reversed - Head Markham to Wimmipeg.

Table 12

HEATER INSPECTION DATA

Test Code No. A
Car No. IC 50187

Fans None Drains Open

Heater Charcoal
Placement 1 ea. end

Inspected at	Date Jan.	Time	OST °F.	Air Temp. BBCL H	Air Temp. BBCL R	Operation H	Operation R	Fuel added lbs. H	Fuel added lbs. R	Fuel in heater lbs. H	Fuel in heater lbs. R	Fuel consumed lbs.	Remarks
St. Paul, Minn.	20	5P	13	53.0	54.0	Lit	Lit	-	-	30	20		Fast draft
Fargo, N.D.	21	9A	-16	59.0	60.5	B	B			10	8	20 12	Heaters removed
Grand Forks, N.D.	21	4P	-10	56.0	55.0	-	-			-	-		Drains plugged
Noyes, Minn.	22	5A	6	55.0	56.0	-	-			-	-		____
Winnipeg, Man.	22	12N	6	54.0	55.5	-	-			-	-		____

Total Fuel ----- 32 lbs.

Notes - Large size Ford Co. briquets used instead of midgets

B - Burning

Heaters - Head #B9595 KO - 1 piece
Rear #B12541 M-40

Table 13

HEATER INSPECTION DATA

Test Code No. B
Car No. IC 50071

Fans None Drains Plugged Heater Charcoal Placement 1 each end

Inspected at	Date Jan.	Time	OST °F	Air Temp. BBCL H	Air Temp. BBCL R	Operation H	Operation R	Fuel added lbs. H	Fuel added lbs. R	Fuel in heater lbs. H	Fuel in heater lbs. R	Fuel consumed lbs. H	Fuel consumed lbs. R	Remarks
St. Paul, Minn	20	5P	13	55.0	55.0	Lit	Lit	-	-	30	30	-	-	Fast draft
Fargo, N.D.	21	9A	-16	59.0	58.5	B	B	-	-	-	10	-	20	Rear heater removed
Grand Forks, N.D.	21	4P	-10	61.0	56.5	B	-	20		10	-	20	-	Refuel front
Noyes, Minn.	22	5A	+6	59.5	56.0	B	-	-	-	-	-	-	-	
Winnipeg, Man.	22	12N	+6	60.5	56.0	B	-	-	-	15	-	15	-	Heater removed
								Total Fuel -----				35	20	
								Car Total ------					55 lbs.	

Notes - Large Ford briquets used

B - Burning

Heaters - Head #B9461 KO - 1 piece

Rear #WFE 0852 MO - 1 piece

Table 14

HEATER INSPECTION DATA

Test Code No. C
Car No. IC 50189

Fans On Drains Open

Heater Charcoal
Placement 1 each end

Inspected at	Date	Time	OST °F	Air Temp. BBCL		Operation		Fuel added lbs.		Fuel in heater lbs.		Fuel consumed lbs.		Remarks
	Jan.			H	R	H	R	H	R	H	R			
St. Paul, Minn.	20	5P	13	57.0	57.5	Lit	Lit	-	-	30	30			Fast draft
Fargo, N.D.	21	9A	-16	63.5	64.0	B	B	-	-	-	10		20	Rear heat removed
Grand Forks, N.D.	21	4P	-10	63.0	60.5	B	-	15	-	15	-	15		
Noyes, Minn.	22	5A	6	64.5	61.0	B	-	-	-	-	-			
Winnipeg, Man.	22	12N	6	64.5	60.5	B	-	-	-	22	-	8		Heater removed
								Total Fuel------				23	20	
								Car total					43 lbs.	

Notes - Large Ford briquets used

B - Burning

Heaters - Head #B6015 MO 1 piece

Rear #WFE 0482 " "

Table 15

HEATER INSPECTION DATA

Test Code No. D
Car No. IC 50114

Fans On Drains Plugged

Heater Charcoal
Placement 1 each end

Inspected at	Date Jan.	Time	OST °F	Air Temp. BBC1 H	Air Temp. BBC1 R	Operation H	Operation R	Fuel added lbs. H	Fuel added lbs. R	Fuel in heater lbs. H	Fuel in heater lbs. R	Fuel consumed lbs. H	Fuel consumed lbs. R	Remarks
St. Paul, Minn.	20	5P	13	57.0	58.5	Lit	Lit	-	-	30	30			Midgets, fast draft
Fargo, N.D.	21	9A	-16	64.5	70.0	B	B	-	-	15	15	15	15	Both heaters removed
Grand Forks, N.D.	21	4P	-10	59.5	62.0	-	-							
Noyes, Minn.	22	5A	6	57.5	64.0	-	-							
Winnipeg, Man.	22	12N	6	56.5	61.0	-	-							
						B	-	-	-	22	-			Heater installed
Winnipeg, Man.	23	uA	10	58.5	63.0	B	-			15		7		Unloading
							Total Fuel-------					22	15 lbs.	
							Car Total						37 lbs.	

Notes - Large Ford briquets used

B - Burning

Heaters - Head WFE 5771 MO-1 piece

Rear WFE 6427 " "

Table 16

HEATER INSPECTION DATA

Test Code No. E
Car No. IC 50163

Thermostat Setting 57 1/2° Heater Alcohol
Fans None Drains Open Placement 1 each end

Inspected at	Date Jan.	Time	OST °F	Air Temp. BBCL H	Air Temp. BBCL R	Operation H	Operation R	Fuel added gals. H	Fuel added gals. R	Fuel in heater gals. H	Fuel in heater gals. R	Remarks
St. Paul, Minn.	20	5P	13	53.5	57.0	Lit	Lit	-	-	4.0	4.0	Thermostat 57 1/2°
Fargo, N.D.	21	9A	-16	54.0	57.0	B	B	-	-	-	-	
Grand Forks, N.D.	21	4P	-10	54.5	57.5	B	B	2.5	2.5	-	-	Reset to 60°
Noyes, Minn.	22	5A	6	54.5	58.0	B	B	-	-	-	-	
Winnipeg, Man.	22	12N	6	55.0	58.0	B	B	-	-			
" "	23	7:45P	10	59.0	60.0	B	B	-	-	0.85	0.5	Heaters extinguished
							Total Fuel------			5.65	6.0	
							Car Total-------				11.65 gals.	

Notes - B - Full burning

Heaters - Head - #0028

Rear #0008

Table 17

HEATER INSPECTION DATA

Test Code No. F
Car No. IC 50190

Thermostat Setting 57 1/2° Heater Alcohol
Fans On Drains Open Placement 1 each end

Inspected at	Date Jan.	Time	OST °F	Air Temp. BBCL H	Air Temp. BBCL R	Burner Operation H	Burner Operation R	Fuel added gals. H	Fuel added gals. R	Fuel in heater gals. H	Fuel in heater gals. R	Remarks
St. Paul, Minn.	20	5P	13	56.5	55.5	Lit	Lit	-	-	4.1	4.0	Thermostat 57 1/2°
Fargo, N.D.	21	9A	-16	57.0	56.5	P	P	-	-	-	-	
Grand Forks, N.D.	21	4P	-10	55.5	55.5	B	P	1.0	2.0			Reset to 60°
Noyes, Minn.	22	5A	6	57.0	57.0	P	B	-	-	-	-	
Winnipeg, Man.	22	12N	6	57.5	57.5	P	PB	-	-	-	-	
" "	23	7A	10	57.5	56.5	D	B					
" "	23	5P	10	-	-	D	B			2.4	0.3	Extinguished
							Total Fuel ------			2.7	5.7	
							Car Total--------				8.4 gals.	

Notes - P-Pilot

PB-Partial full burning

B- Full Burning

D-Dark - not burning

Heaters - Head - #0049
Rear - #0044

Table 18

HEATER INSPECTION DATA

Test Code No. G
Car No. IC 51000

Thermostat Setting 57 1/2°
Fans On Drains Auto

Heater Alcohol
Placement 1 each end

Inspected at	Date Jan.	Time	OST °F	Air Temp. BBCL H	Air Temp. BBCL R	Burner Operation H	Burner Operation R	Fuel added gals. H	Fuel added gals. R	Fuel in heater gals. H	Fuel in heater gals. R	Remarks
St. Paul, Minn.	20	5P	13	56.0	55.5	Lit	Lit	-	-	3.0	4.1	Thermostat 57 1/2°
Fargo, Ind.	21	9A	-16	55.5	55.0	P	P	-	-	-	-	
Grand Forks, N.D.	21	4P	-10	54.5	53.0	PB	PB	2.0	1.5			Reset to 60°
Noyes, Minn.	22	5A	6	55.5	55.0	P	P	-	-	-	-	
Winnipeg, Man.	22	12N	6	55.5	55.0	B	P	-	-	2.25	2.40	Heaters Extinguished 1 charcoal heater Installed head end Fast burning*
						Total fuel -------				2.75	3.20	
						Car Total -------					5.95	

Notes- P-Pilot
PB-Partial full burning
B-Full burning

Heaters - Head #0019
Rear #0043

*No record of burning time or fuel consumed

Table 19

HEATER INSPECTION DATA

Test Code No. H
Car No. NRC 18464

Thermostat Setting 57 1/2°
Fans Off Drains Auto

Heater Alcohol
Placement 1 ea. end

Inspected at	Date Jan.	Time	OST °F	Air Temp. BBCL H	Air Temp. BBCL R	Burner operation H	Burner operation R	Fuel added gals. H	Fuel added gals. R	Fuel in heater gals. H	Fuel in heater gals. R	Remarks
St. Paul, Minn.	20	5P	13	50.0	53.0	Lit	Lit	-	-	3.1	3.0	
Fargo, N.D.	21	9A	-16	51.5	53.0	B	B	-	-	-	-	Drains plugged
Grand Forks, N.D.	21	4P	-10	53.5	54.0	B	B	2.5	2.5			Reset 60°
Noyes, Minn.	22	5A	6	54.5	55.5	B	B	-	-			Fans put on
Winnipeg, Man.	22	12N	6	56.5	55.5	B	P	1.75	1.5	3.5	3.3	
" "	23	9:30A	12	59.5	60.0	B	PB	-	-	-	-	
" "	23	1:30P	10	-	-	B	B			1.0	1.2	Extinguished
						Total Fuel -------				7.35	7.0	
						Car total					14.35	gals.

Notes - P-Pilot
PB-Partial full burning
B-Full burning

Heaters-Head - #0062
Rear - #0034

Table 20

HEATER INSPECTION DATA

Test Code No. J
Car NO. IC 50426

Fans On Drains Plugged

Heater Luminator-Mitchel
Placement Underslung

Inspected at	Date Jan.	Time	OST °F	Air Temp. BBCL H	Air Temp. BBCL R	Operation	Fuel added lbs.	Fuel in heater lbs.	Remarks
St. Paul, Minn.	20	5P	13	55.5	56.0	Lit	60		Damper #4 position
Fargo, N.D.	21	9A	-16	57.5	58.0	B	-	-	" " "
Grand Forks, N.D.	21	4P	-10	56.0	56.5	B	20	20	" " "
Noyes, Minn.	22	5A	6	56.5	57.0	B			" " "
Winnipeg, Man.	22	12N	6	56.0	56.0	B	20		" " "
" "	23	7A	10	53.5	55.5	B	-		" " "
" "	23	2P	5	-	-	B		20	Damper closed at unloading

Total fuel----- 80 lbs.

Notes - Large Ford briquets used

B - Burning

Table 21

Composition of the air taken from under floor racks at doorway in cars during transit.

	A Non-Fan Open	B Non-Fan Plugged	C Fan Open	D Fan Plugged	E Non-Fan Open	F Fan Open	G Fan Self Sealing	H Non-Fan External Trap	J Fan Plugged
				Per cent Carbon Dioxide					
Jackson, Miss.	.2	.5	.2	.4	.2	.1	.2	.3	.2
Memphis, Tenn.	.2	.7	.1	.3	.2	.1	.4	.5	.4
Chicago, Ill.	0	.1	0	0	.1	0	0	0	.1
E. Dubuque, Ill.	.1	.3	.2	.2	.3	.1	.2	.2	.2
St. Paul, Min.	.1	.4	.1	.1	.1	0	.3	.2	.2
Fargo, N.D.	2.3	3.6	2.4	1.8	1.0	.6	1.5 3/	.7	.2
G. Forks, N.D.	.2 1/	2.6 2/	1.3 2/	.8 1/	.9	.8 .5 3/	1.5 3/	2.0 4/	.3
Winnipeg, Man.	.2	1.6	1.4	.4	1.1	.7 .2 3/	1.8 3/	1.5	.2
				Per cent Oxygen					
Jackson, Miss,	19.9	19.8	20.1	20.1	20.2	20.3	20.2	19.9	20.0
Memphis, Tenn.	20.0	19.6	20.0	20.0	20.1	20.2	20.0	20.0	19.9
Chicago, Ill.	20.1	20.0	20.2	20.1	20.1	20.2	20.2	20.1	20.0
E. Dubuque, Ill.	20.1	20.2	20.2	20.1	20.0	20.1	20.1	20.3	20.1
St. Paul, Minn.	20.2	19.9	20.1	20.0	20.1	20.2	19.8	19.9	20.0
Fargo, N. D.	17.7	16.3	17.8	17.3	19.0	19.2	18.4 3/	18.8	20.1
Grand Forks, N. D.	19.8 1/	17.0 2/	18.5 2/	19.7 1/	18.3	19.7 19.8 3/	18.5 3/	18.5 4/	20.0
Winnipeg, Man.	20.0	18.6	18.7	19.6	19.1	19.3 19.9 3/	18.0 3/	18.5	20.1
				Per cent Carbon Monoxide					
Fargo, N.D.	.1	.3	.3	.1	.0	.0	.0	.0	.0
Grand Forks, N.D.	.0	.2	.1	.0	.0	.0	.0	.0	.0
Winnipeg, Man.	.0	.2	.0	.1	.0	.0	.0	.0	.0

1/ Both charcoal heaters removed at Fargo.
2/ One charcoal heater removed at Fargo.
3/ These samples taken from ice grate level in bunker.
4/ Drains were plugged at Fargo.

Figure 1

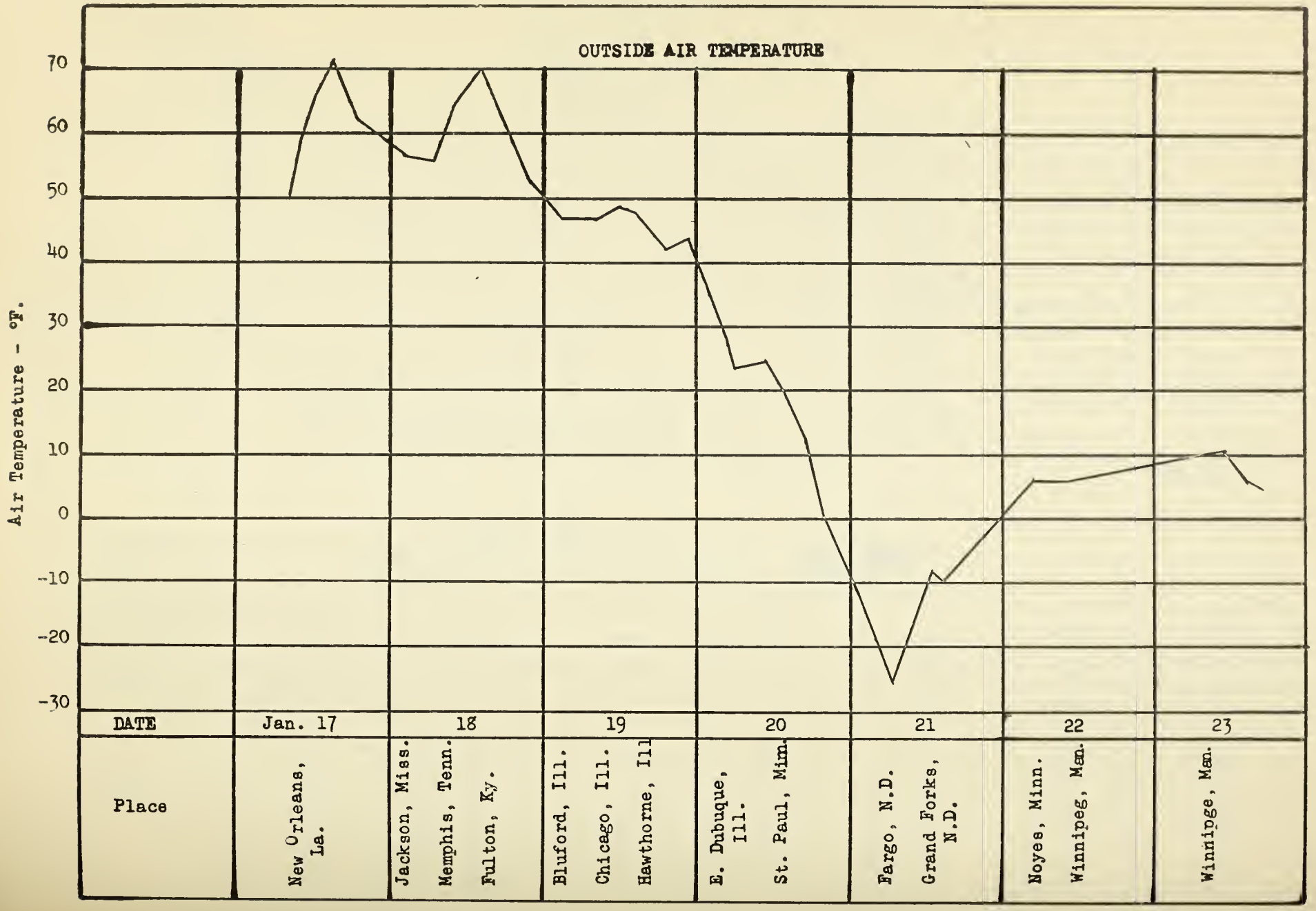
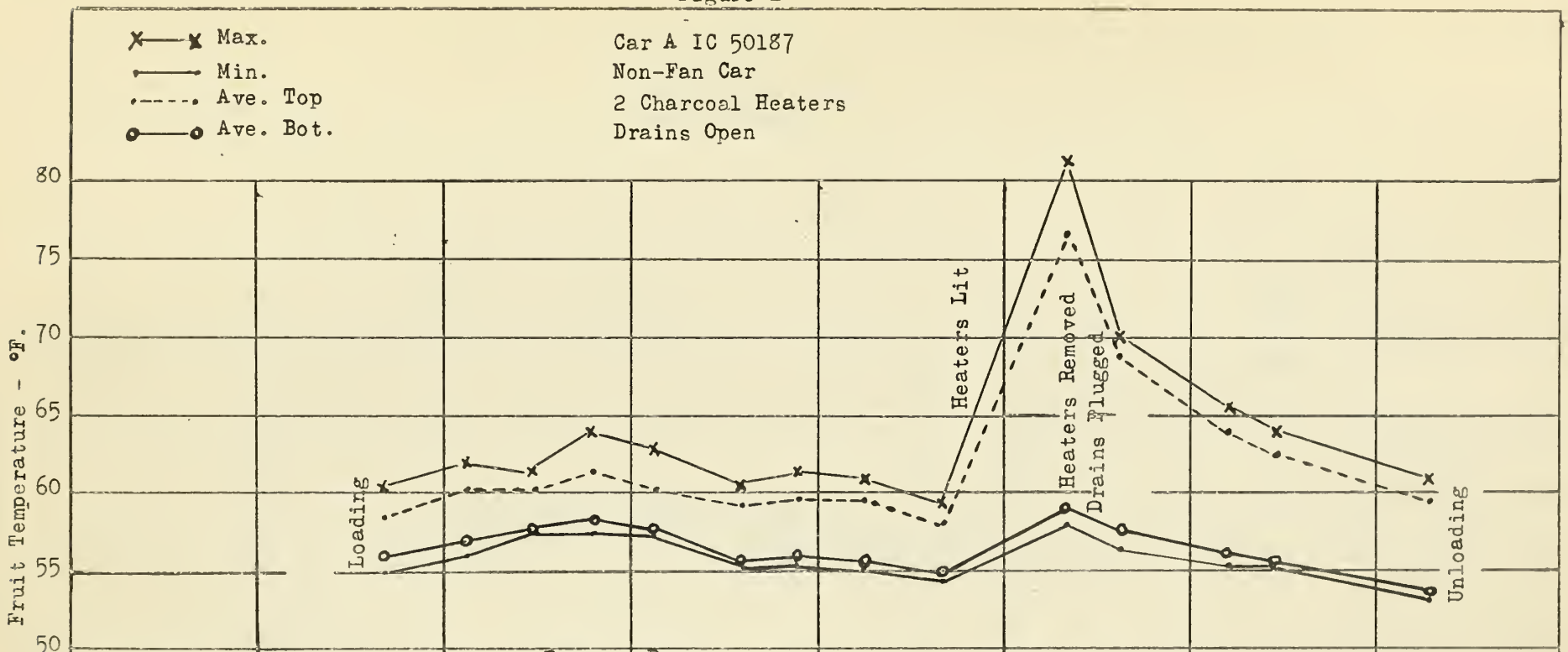
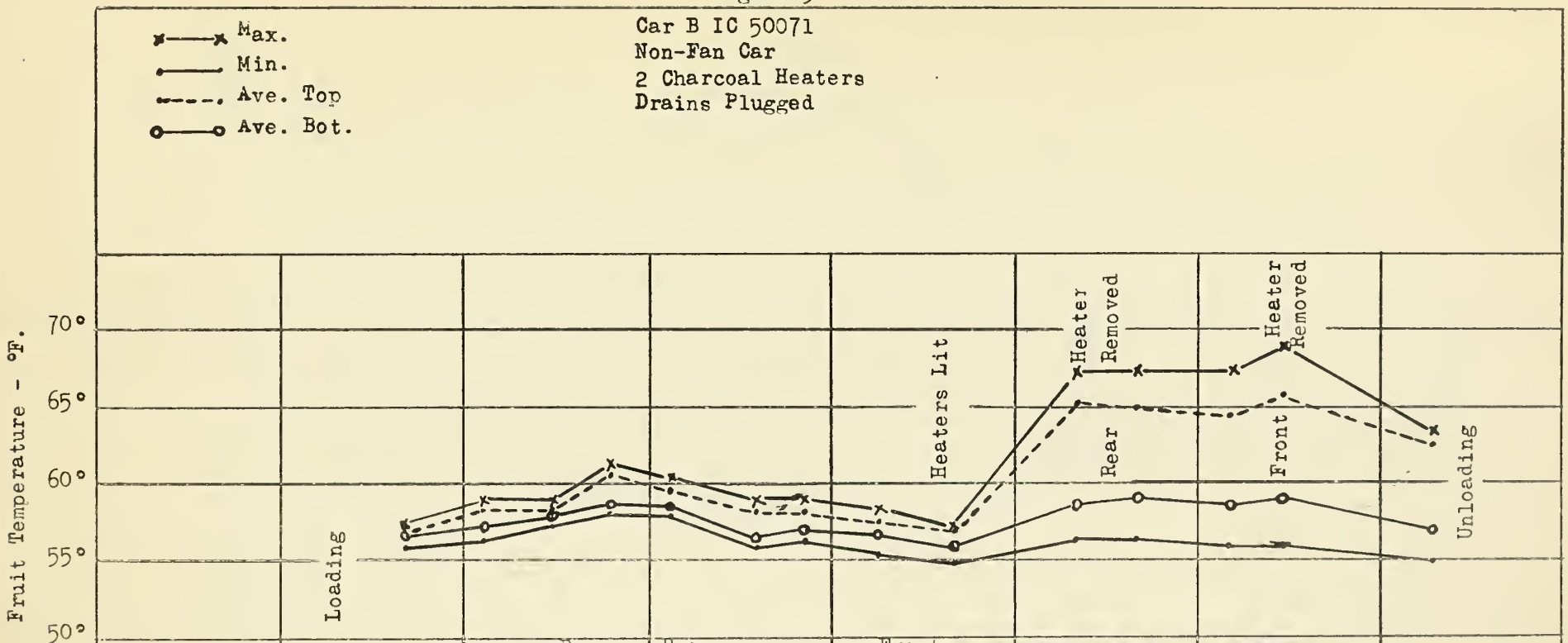

OUTSIDE AIR TEMPERATURE
Air Temperature - °F.
70
60
50
40
30
20
10
0
-10
-20
-30
DATE
Jan. 17
18
19
20
21
22
23
Place
New Orleans, La.
Jackson, Miss.
Memphis, Tenn.
Fulton, Ky.
Bluford, Ill.
Chicago, Ill.
Hawthorne, Ill
E. Dubuque, Ill.
St. Paul, Minn.
Fargo, N.D.
Grand Forks, N.D.
Noyes, Minn.
Winnipeg, Man.
Winnipge, Man.

Figure 2



Vent and Heater Record	Vents Closed	Rear Open 2"	Rear Open Full 11"	Vents Closed	Both Heaters		
OST - Max.	72°	70°	49°	40°	0°	9°	11°
Min.	50°	50°	40°	-9°	-25°	0°	5°
Date	Jan. 17	18	19	20	21	22	23
Place	New Orleans, La.	Jackson, Miss. Memphis, Tenn. Fulton, Ky.	Bluford, Ill. Chicago, Ill. Hawthorne, Ill.	E. Dubuque, Ill. St. Paul, Min.	Fargo, N.D. Grand Forks, N.D.	Noyes, Minn. Winnipeg, Man.	Winnipeg, Man.

Figure 3.



Vent and Heater Record	Vents Closed	Rear Open 2"	Rear Open Full 11"	Vents Closed	Front Rear		
OST Max.	72°	70°	49°	40°	0°	9°	11°
Min.	50°	50°	40°	-9°	-25°	0°	5°
Date	Jan. 17	18	19	20	21	22	23
Place	New Orleans, La.	Jackson, Miss. Memphis, Tenn. Fulton, Ky.	Bluford, Ill. Chicago, Ill. Hawthorne, Ill.	E. Dubuque, Ill. St. Paul, Minn.	Fargo, N.D. Grand Forks, N.D.	Noyes, Minn. Winnipeg, Man.	Winnipeg, Man.

Figure 4

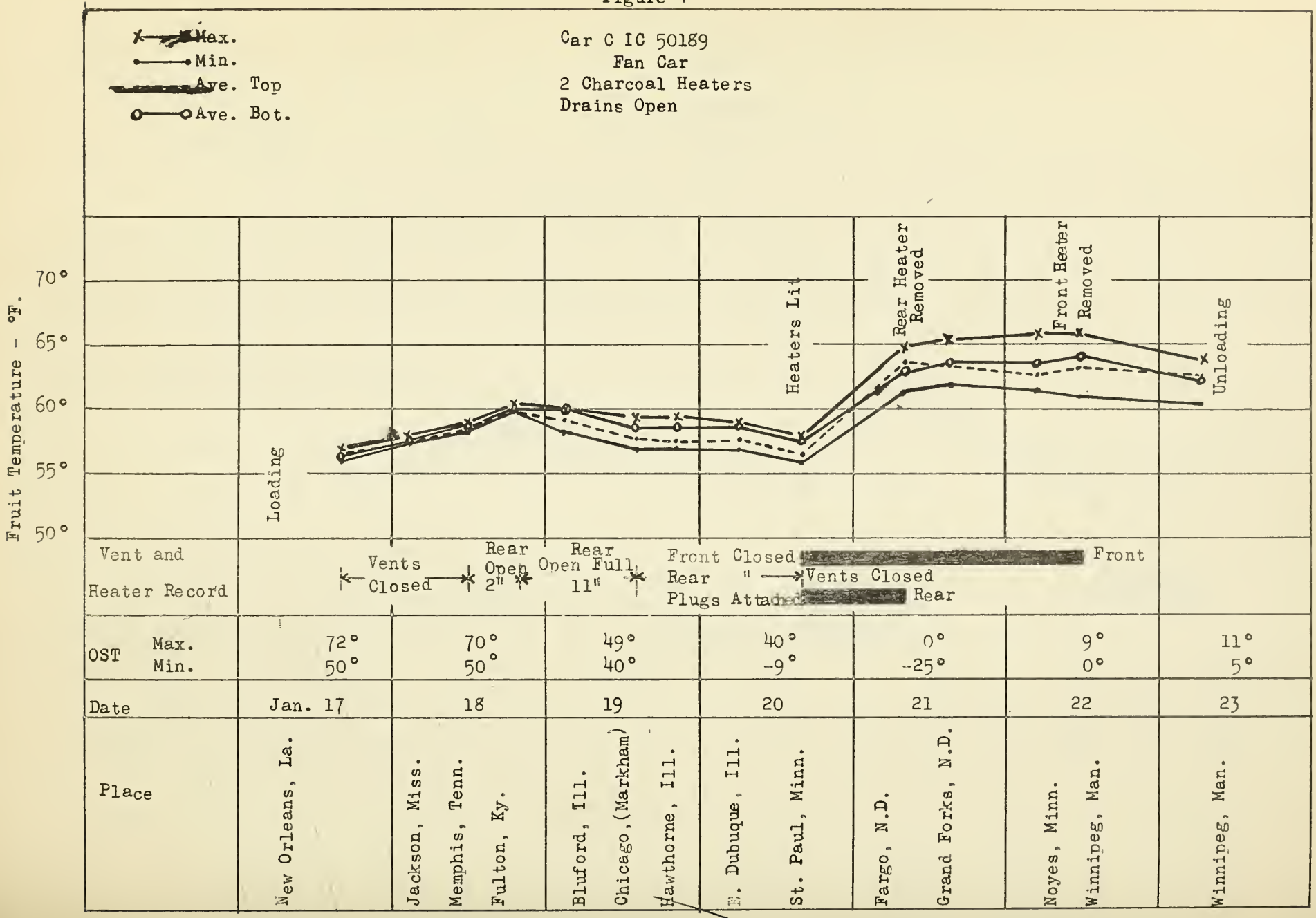
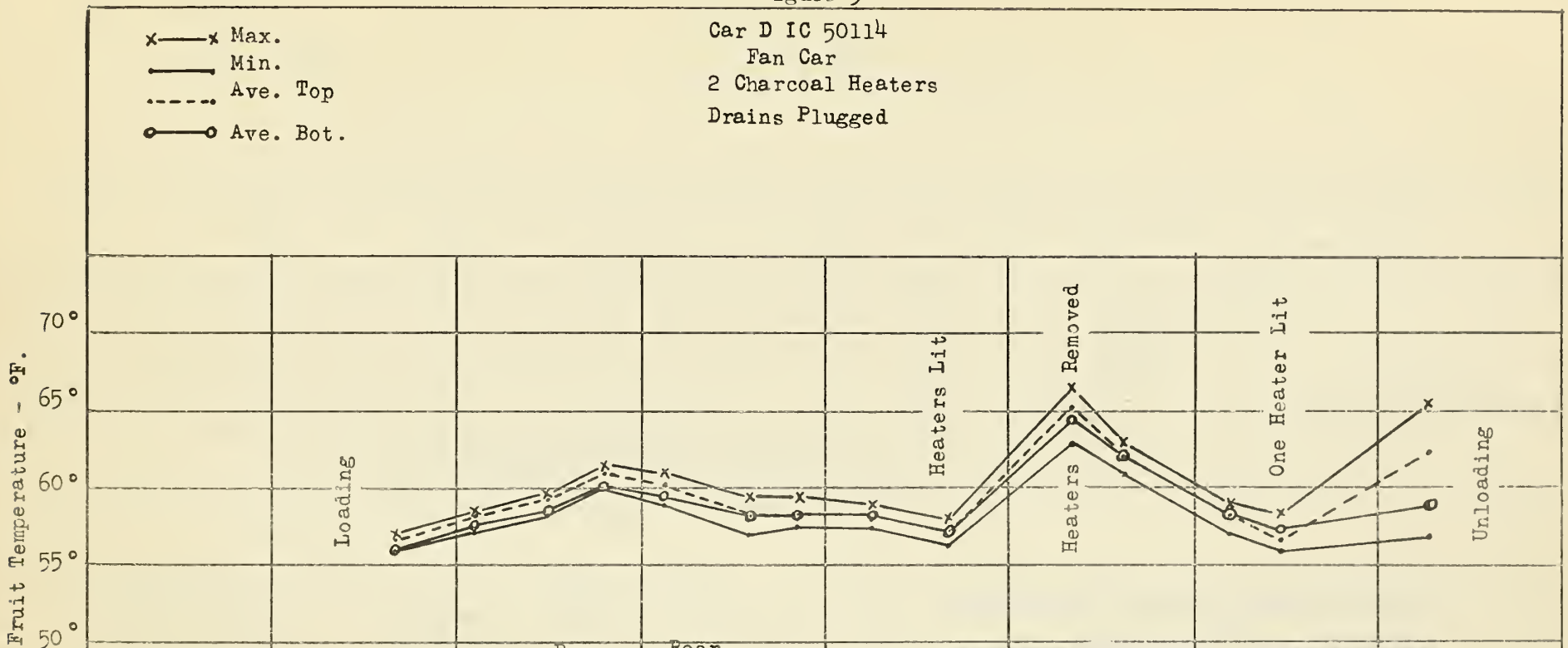
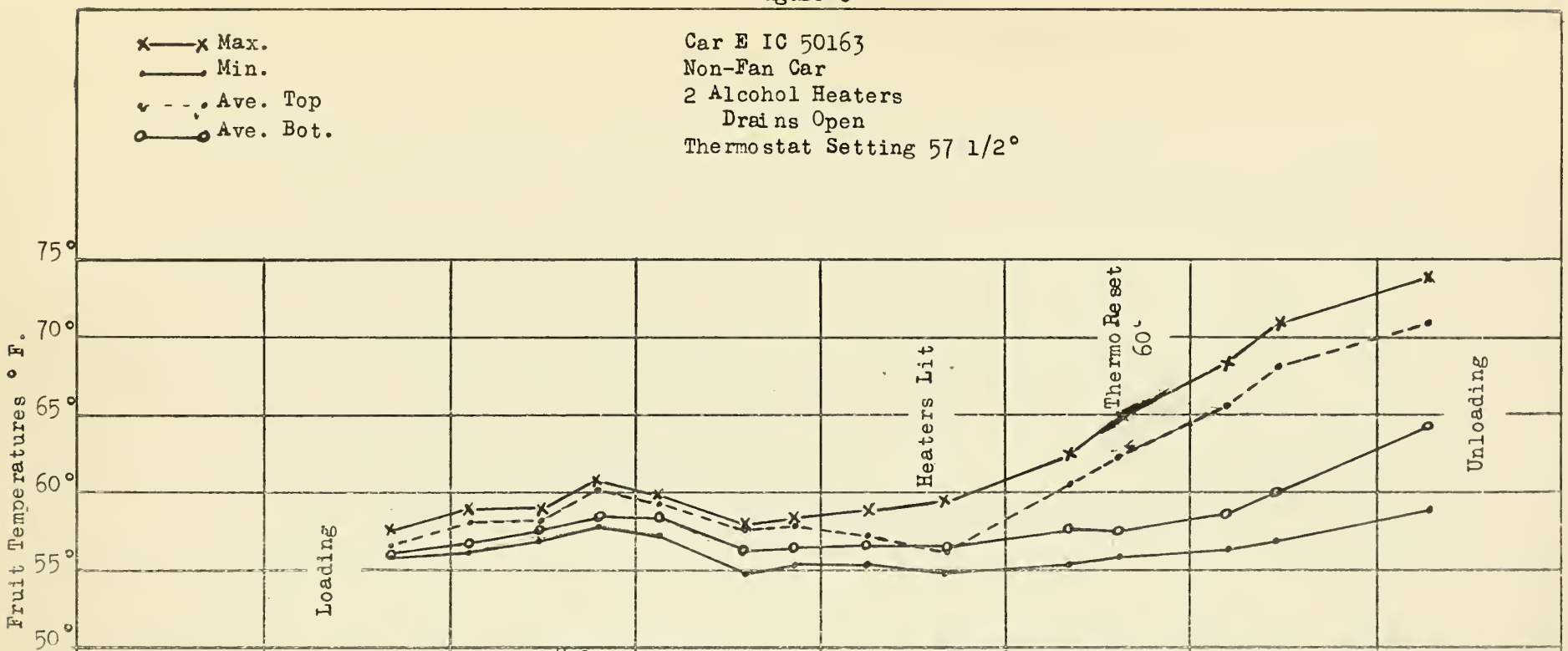

Max.
Min.
Ave. Top
Ave. Bot.
Car C IC 50189
Fan Car
2 Charcoal Heaters
Drains Open
Fruit Temperature - °F.
70°
65°
60°
55°
50°
Loading
Heaters Lit
Rear Heater Removed
Front Heater Removed
Unloading
Vent and Heater Record
Vents Closed
Rear Open 2"
Rear Open Full 11"
Front Closed
Front
Rear "
Vents Closed
Plugs Attached
Rear
OST Max. 72° 70° 49° 40° 0° 9° 11°
Min. 50° 50° 40° -9° -25° 0° 5°
Date Jan. 17 18 19 20 21 22 23
Place
New Orleans, La.
Jackson, Miss.
Memphis, Tenn.
Fulton, Ky.
Bluford, Ill.
Chicago, (Markham)
Hawthorne, Ill.
E. Dubuque, Ill.
St. Paul, Minn.
Fargo, N.D.
Grand Forks, N.D.
Noyes, Minn.
Winnipeg, Man.
Winnipeg, Man.

Figure 5



Vent and Heater Record	Vents Closed	Rear Open 2"	Rear Open Full 11"	Front Closed Rear " Plugs Attached	Front Vents Closed Rear		
OST Max.	72°	70°	49°	40°	0°	9°	11°
Min.	50°	50°	40°	-9°	-25°	0°	5°
Date	Jan. 17	18	19	20	21	22	23
Place	New Orleans, La.	Jackson, Miss. Memphis, Tenn. Fulton, Ky.	Bluford, Ill. Chicago (Markham) Hawthorne, Ill.	E. Dubuque, Ill. St. Paul, Minn.	Fargo, N.D. Grand Forks, N.D.	Noyes, Minn. Winnipeg, Man.	Winnipeg, Man.

Fugure 6



Vent and Heater Record	← Vents Closed	→ Rear Open 2" ←	Rear Open Full 11" →	Closed →	Front / Rear Full Burning		
OST Max.	72°	70°	49°	40°	0°	9°	11°
OST Min.	50°	50°	40°	-9°	-25°	0°	5°
Date	Jan. 17	18	19	20	21	22	23
Place	New Orleans, La.	Jackson, Miss. / Memphis, Tenn. / Fulton, Ky.	Bluford, Ill. / Chicago (Markham) / Hawthorne, Ill.	E. Dubuque, Ill. / St. Paul, Minn.	Fargo, N.D. / Grand Forks, N.D.	Noyes, Minn. / Winnipeg, Man.	Winnipeg, Man.

Figure 7

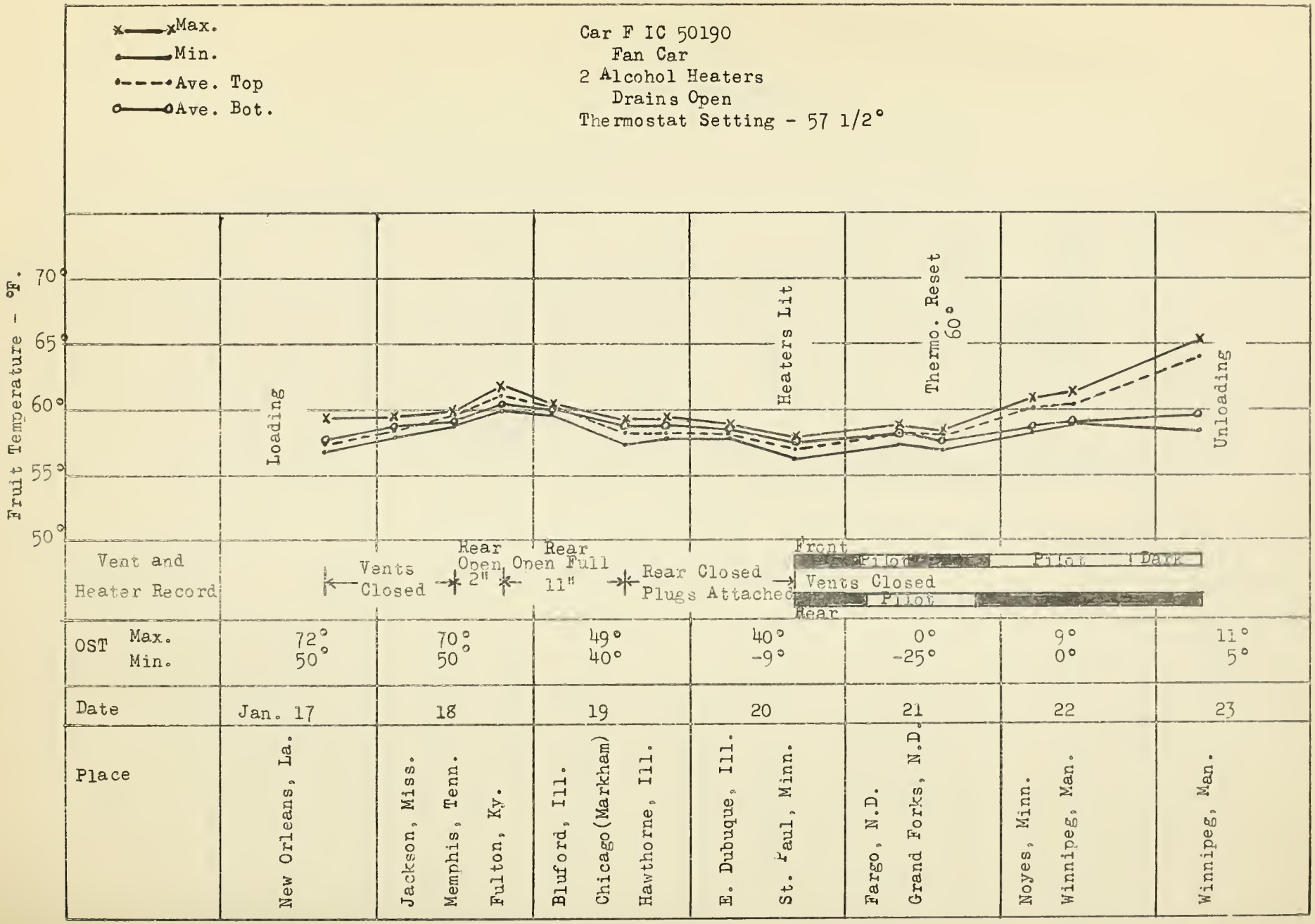
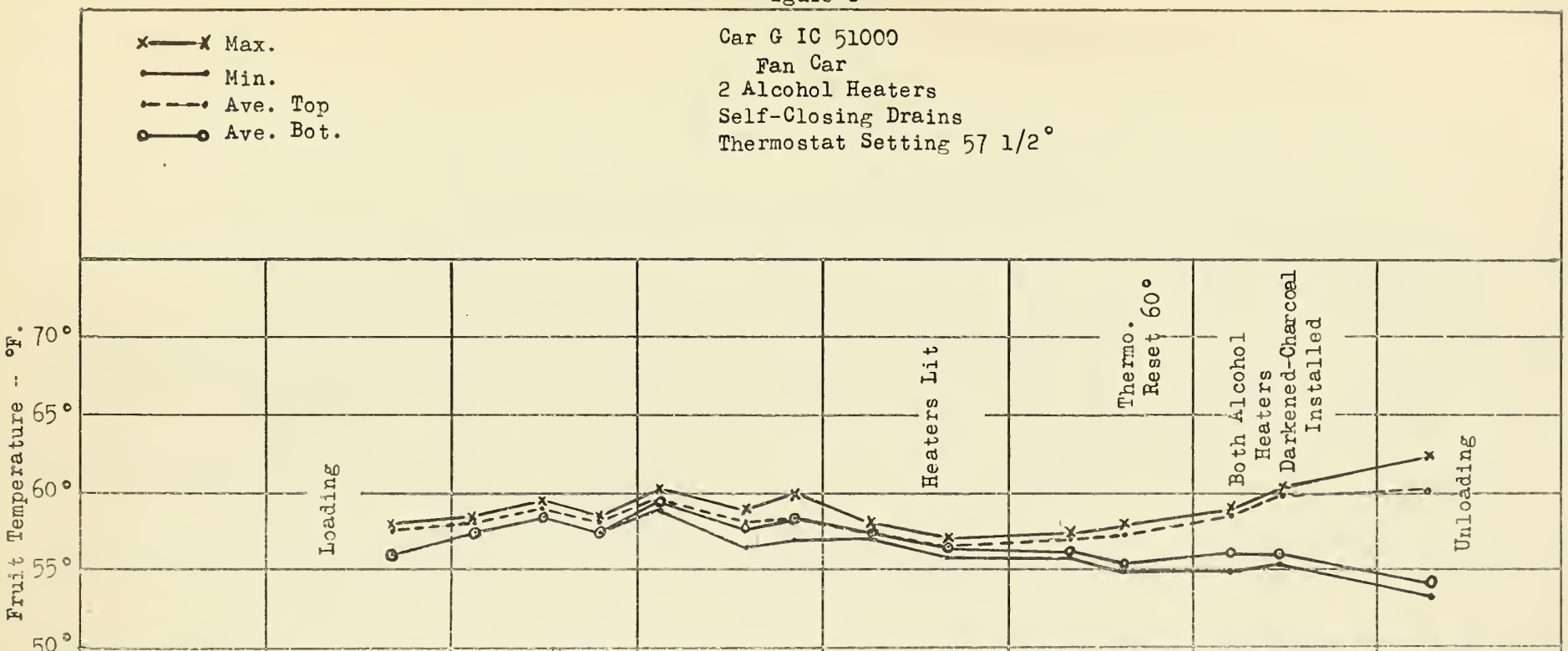

Max.
Min.
Ave. Top
Ave. Bot.
Car F IC 50190
Fan Car
2 Alcohol Heaters
Drains Open
Thermostat Setting - 57 1/2°
Fruit Temperature - °F.
70°
65°
60°
55°
50°
Loading
Heaters Lit
Thermo. Reset 60°
Unloading
Vent and Heater Record
Vents Closed
Rear Open 2"
Rear Open Full 11"
Rear Closed Plugs Attached
Front
Pilot
Pilot
Dark
Vents Closed
Pilot
Rear
OST Max.
Min.
72° 50°
70° 50°
49° 40°
40° -9°
0° -25°
9° 0°
11° 5°
Date
Jan. 17
18
19
20
21
22
23
Place
New Orleans, La.
Jackson, Miss.
Memphis, Tenn.
Fulton, Ky.
Bluford, Ill.
Chicago (Markham)
Hawthorne, Ill.
E. Dubuque, Ill.
St. Paul, Minn.
Fargo, N.D.
Grand Forks, N.D.
Noyes, Minn.
Winnipeg, Man.
Winnipeg, Man.

Figure 8



Vent and Heater Record	Vents Closed	Rear Open 2"	Rear Full Open 11"	Rear Closed Plugs Attached	Pilot / Pilot / Vents Closed / Pilot / Pilot	Charcoal Heater	
OST Max.	72°	70°	49°	40°	0°	9°	11°
OST Min.	50°	50°	40°	-9°	-25°	0°	5°
Date	Jan 17	18	19	20	21	22	23
Place	New Orleans, La.	Jackson, Miss. / Memphis, Tenn. / Fulton, Ky.	Bluford, Ill. / Chicago(Markham) / Hawthorne, Ill.	E. Dubuque, Ill. / St. Paul, Minn.	Fargo, N.D. / Grand Forks, N.D.	Noyes, Minn. / Winnipeg, Man.	Winnipeg, Man.

Figure 9

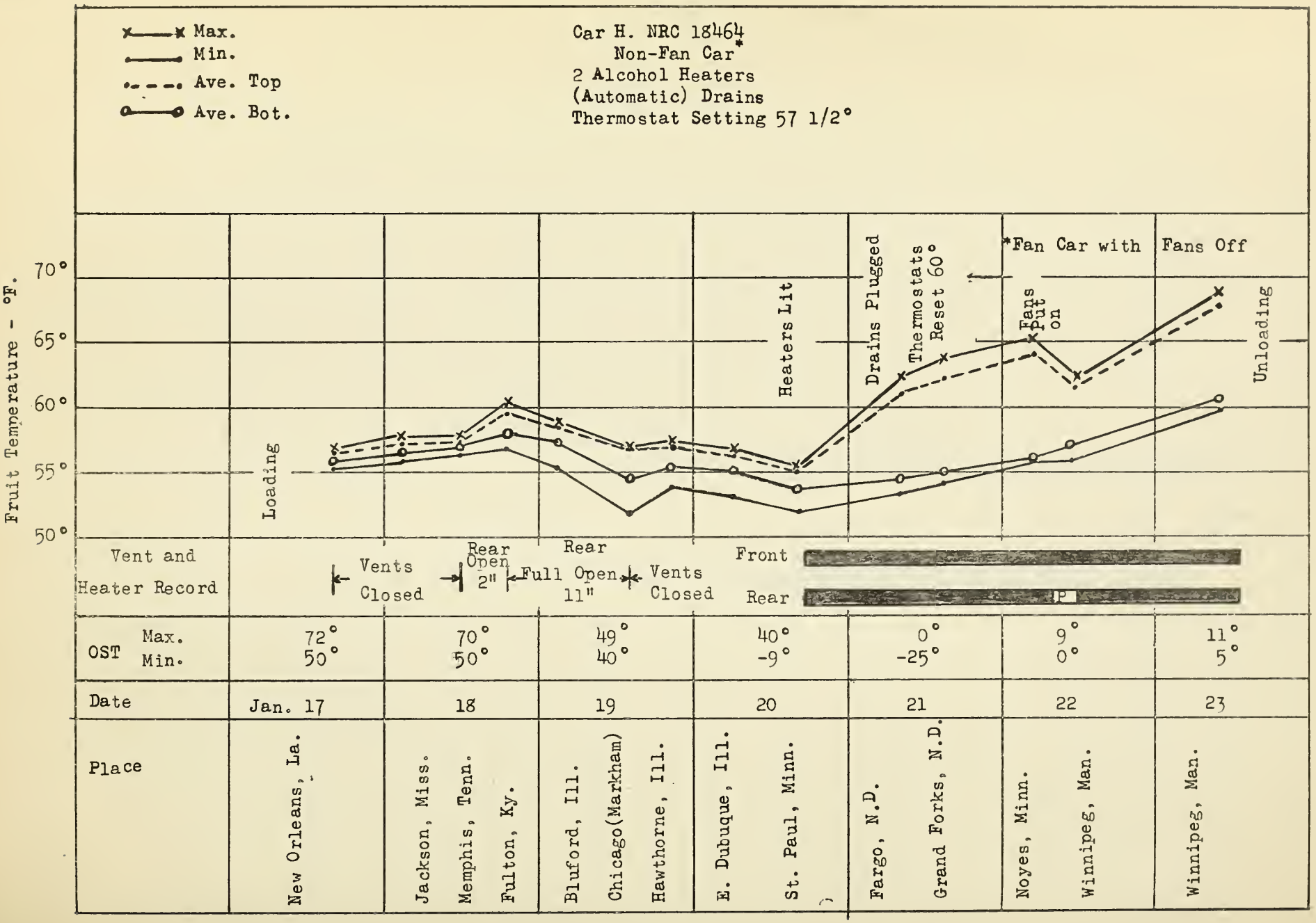

Max.
Min.
Ave. Top
Ave. Bot.
Car H. NRC 18464
Non-Fan Car*
2 Alcohol Heaters
(Automatic) Drains
Thermostat Setting 57 1/2°
Fruit Temperature - °F.
70°
65°
60°
55°
50°
Loading
Heaters Lit
Drains Plugged
Thermostats Reset 60°
Fans Put on
*Fan Car with Fans Off
Unloading
Vent and Heater Record
Vents Closed
Rear Open 2"
Rear Full Open 11"
Vents Closed
Front
Rear
OST Max.
OST Min.
72° 50°
70° 50°
49° 40°
40° -9°
0° -25°
9° 0°
11° 5°
Date
Jan. 17
18
19
20
21
22
23
Place
New Orleans, La.
Jackson, Miss.
Memphis, Tenn.
Fulton, Ky.
Bluford, Ill.
Chicago (Markham)
Hawthorne, Ill.
E. Dubuque, Ill.
St. Paul, Minn.
Fargo, N.D.
Grand Forks, N.D.
Noyes, Minn.
Winnipeg, Man.
Winnipeg, Man.

Figure 10

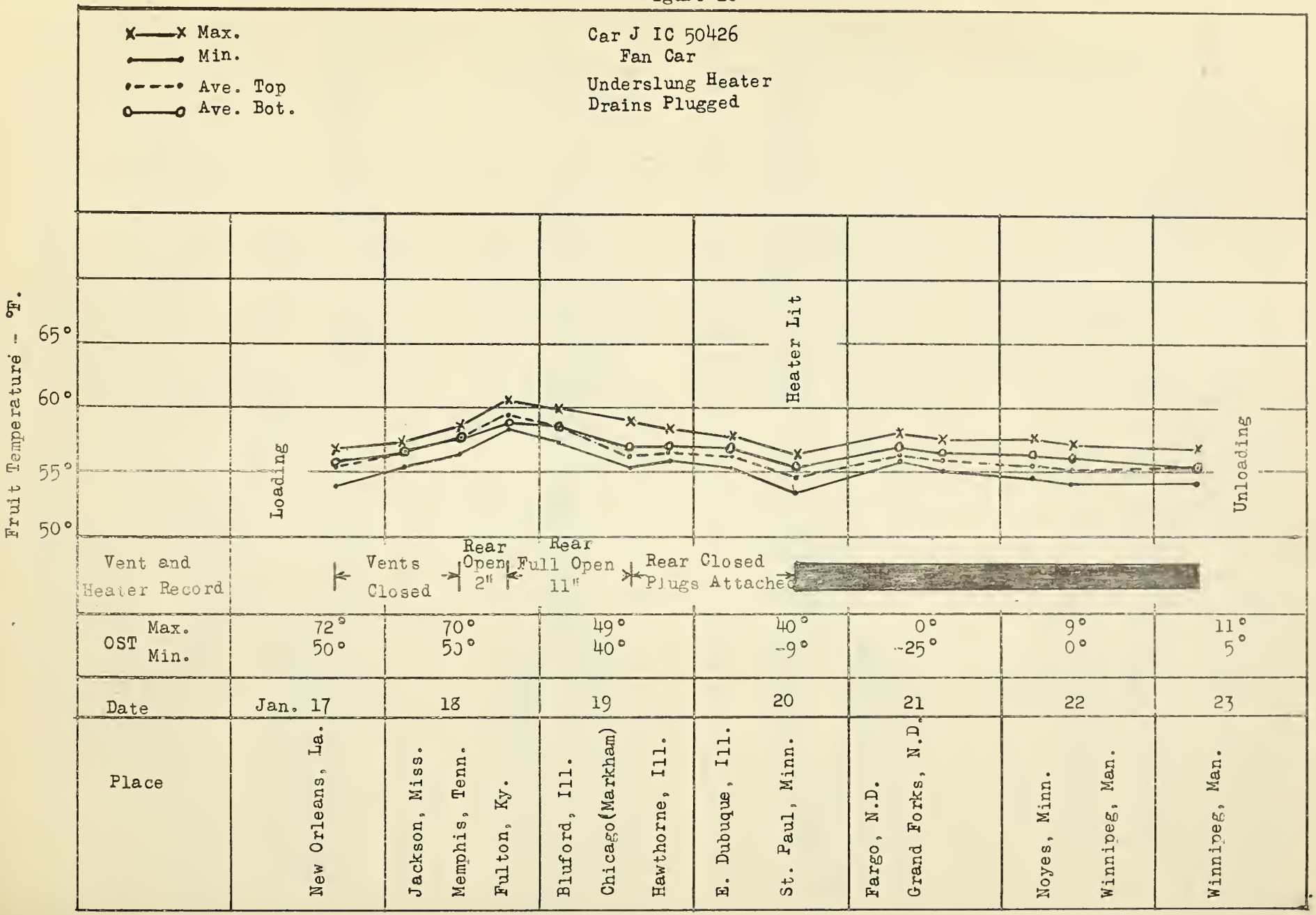

Max.
Min.
Ave. Top
Ave. Bot.
Car J IC 50426
Fan Car
Underslung Heater
Drains Plugged
Fruit Temperature - °F.
65°
60°
55°
50°
Loading
Heater Lit
Unloading
Vent and Heater Record
Vents Closed
Rear Open 2"
Rear Full Open 11"
Rear Closed Plugs Attached
OST Max.
OST Min.
72° 50°
70° 50°
49° 40°
40° -9°
0° -25°
9° 0°
11° 5°
Date
Jan. 17
18
19
20
21
22
23
Place
New Orleans, La.
Jackson, Miss.
Memphis, Tenn.
Fulton, Ky.
Bluford, Ill.
Chicago (Markham)
Hawthorne, Ill.
E. Dubuque, Ill.
St. Paul, Minn.
Fargo, N.D.
Grand Forks, N.D.
Noyes, Minn.
Winnipeg, Man.
Winnipeg, Man.

Figure 11

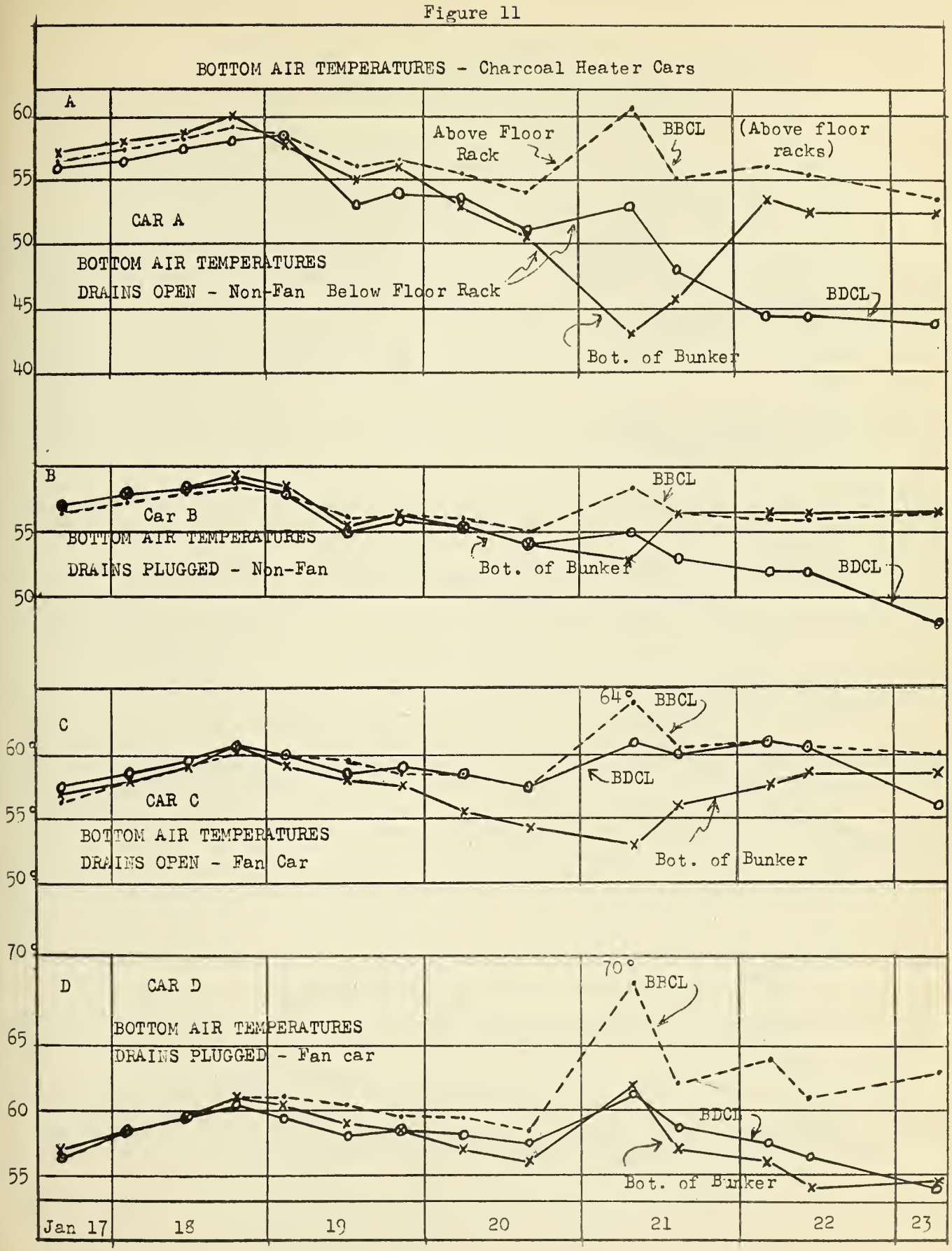

BOTTOM AIR TEMPERATURES - Charcoal Heater Cars
A
60
55
50
45
40
Above Floor Rack
BBCL
(Above floor racks)
CAR A
BOTTOM AIR TEMPERATURES
DRAINS OPEN - Non-Fan
Below Floor Rack
BDCL
Bot. of Bunker
B
BBCL
Car B
55
BOTTOM AIR TEMPERATURES
DRAINS PLUGGED - Non-Fan
Bot. of Bunker
BDCL
50
C
64°
BBCL
60°
BDCL
CAR C
55°
BOTTOM AIR TEMPERATURES
DRAINS OPEN - Fan Car
Bot. of Bunker
50°
70°
D
CAR D
70°
BBCL
BOTTOM AIR TEMPERATURES
65
DRAINS PLUGGED - Fan car
60
BDCL
55
Bot. of Bunker
Jan 17
18
19
20
21
22
23

Figure 12
BOTTOM AIR TEMPERATURES - Charcoal Heater Cars
Bottom Bulkhead Position (BBCL) 3" Above Floor Rack

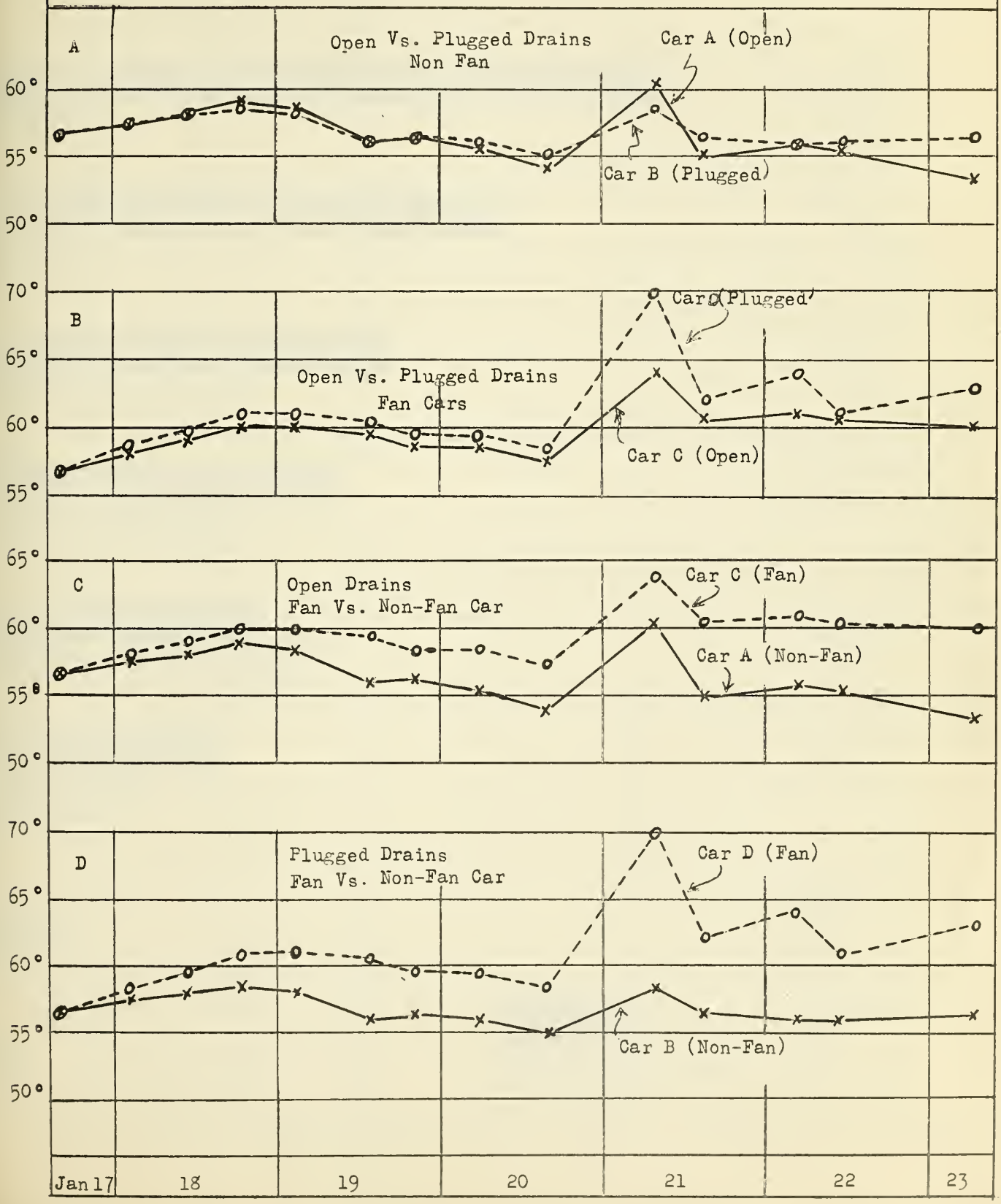
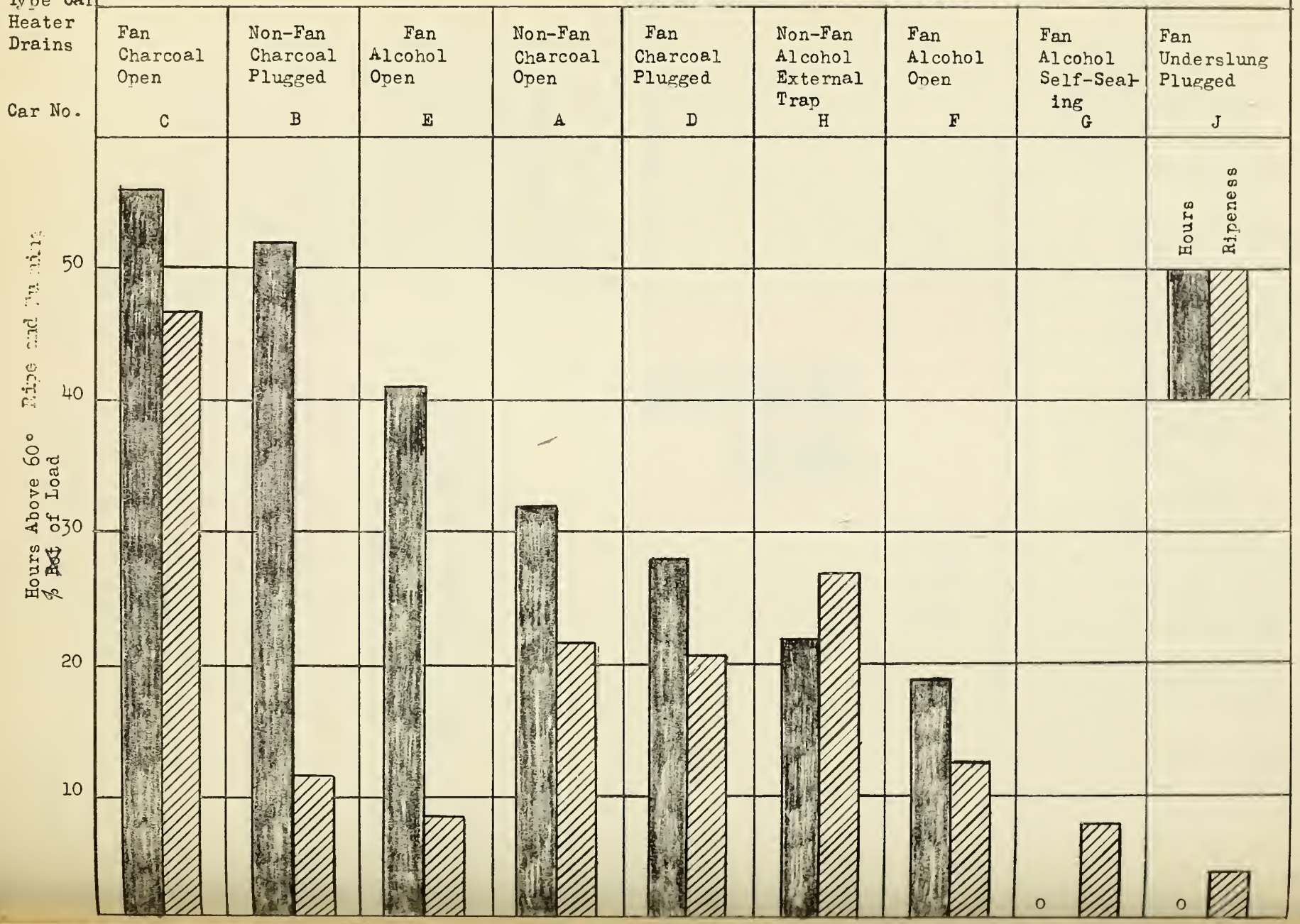


Figure 13

HOURS AVERAGE CAR TEMPERATURE ABOVE 60°
and
% of RIPES & TURNINGS